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ELECTRICAL WORLD

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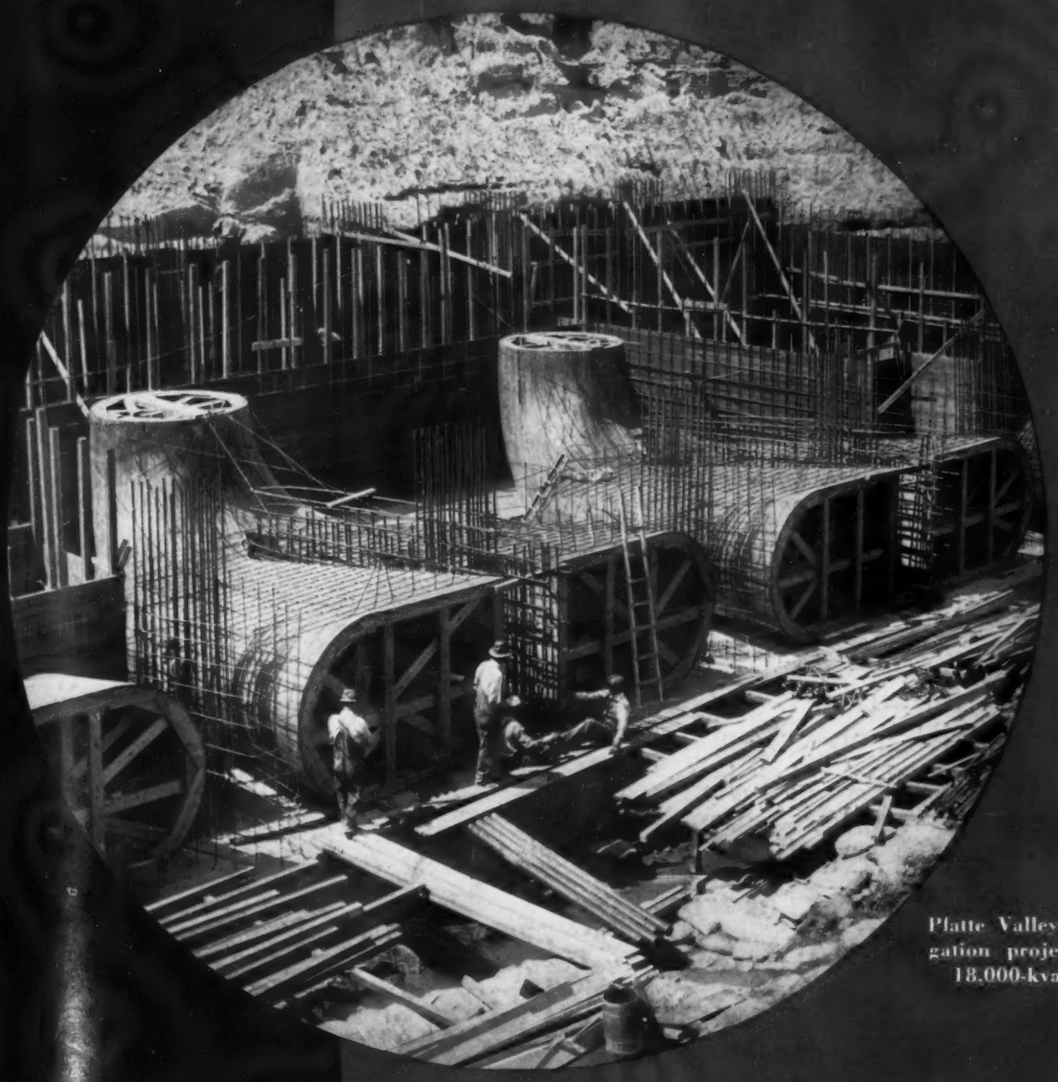


Platte Valley power and irrigation project includes two 18,000-kva. hydro units

September 14, 1935

Results With 110-Kv. Quick-Reclosing Breakers

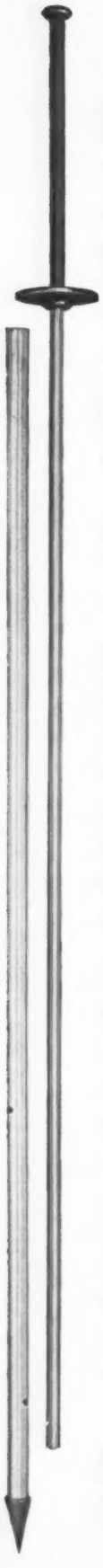
Iowa Active in Rural Electrification

Electric Furnaces With Controlled Atmospheres

Survey of Industrial Plant Changes

Advocates Low-Cost Wiring and Appliances

Hoover on Specialty Selling



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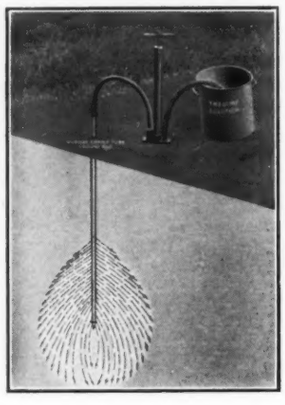

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Reader's Guide to This Issue

This index is merely a convenient guide. Many articles will appeal to several reader groups—many will apply to all. News and other departments are of general interest.

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LETTERS TO THE EDITOR

More Light on Weak Point of Wood Pole

To the Editor of ELECTRICAL WORLD:

The formulas in calculating deflections of wood poles as presented by B. E. Ellsworth in the April 27, 1935, issue and by Myron Zucker in the July 6, 1935, issue, recall to the writer's mind one aspect of wood pole deflection computations that is ordinarily neglected even though important.

The standard formula for the distance from the point of application of the load at the pole top to the weakest section is ordinarily expressed as

$$y = x - a = d_1/2t$$

where y = distance from point of application of the load to the weakest section.
x = distance from the pole top to the weakest section.
a = distance from the pole top to the point of application of the load.
d_1 = pole diameter at point of application of the load.
t = taper of the pole.

The derivation of this standard formula does not take into account the force on the pole itself due to the wind, which is important in setting up stresses in a pole.

When this wind pressure on the pole itself is taken into consideration the formula is much more complex and is expressed by

$$x = \frac{d}{2t} + \frac{3}{2}\,\frac{6Pa + qf^2(3d + 2tf)}{6P + 3qf(2d + tf)}$$

where P = load on the pole.
q = wind pressure on the pole per sq.in. of projected area.
f = height of the pole above ground.
d = pole diameter at the top.

When applying these two formulas to an 8-in., 35-ft. pole, set 6 ft. in the ground, a 57-mile wind and a 1,000-lb. load the weakest section is found to shift from 8¾ ft. above the ground line down to a level of 5¼ ft. as soon as the wind pressure on the pole itself is taken into account.

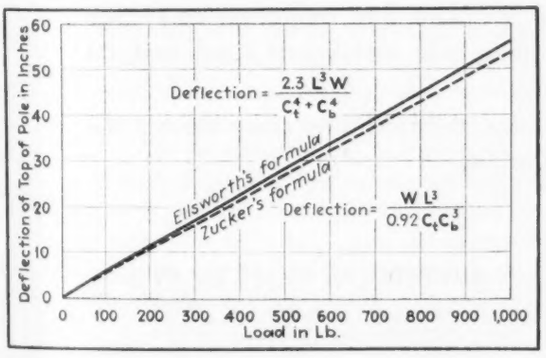
Having seen where poles actually break under transverse load, this new formula gives a probable explanation why practical engineers have not put much confidence in the commonly so-called theoretical weakest point of a pole. Details as worked out by Bernard E. Lowe as a part of his master's thesis project are given on pages 63 to 75 of Oklahoma Agricultural and Mechanical College Engineering Experiment Station Publication No. 20, "Rural Line Design Investigations."

A. NAETER,
Head of Elec'l Eng'g Dept., Oklahoma A. M. College, Stillwater, Okla.

To the Editor of ELECTRICAL WORLD:

It was with a great deal of interest that I read Mr. Zucker's item regarding pole deflection in the July 6, 1935, ELECTRICAL WORLD.

As a matter of curiosity, curves were plotted of the deflection in a 45-ft. pole for various loadings using your formula and mine. You will note that they are within 3½ per cent of each other. This small error is far within the accuracy of wood measurements and values used for the modulus of elasticity. I feel that this provides an additional check for my formula, which has been used in many pole calculations.



Two formulas for tapered pole deflection practically identical

The formula published last April in the ELECTRICAL WORLD was derived from graphical data used in airplane design. We feel that it is not far from being correct as the deflection in most deflection formulas for round numbers varies inversely with the fourth power of the circumference dimension.

I have found in dealing with such formulas that they may be identical and yet appear in different terms and look nothing alike. I have no reason to doubt your formula and am glad it checks so closely with mine.

B. ELLSWORTH,
Engineer,
Iowa-Nebraska L. & P. Co.,
Lincoln, Neb.

Approximate Power Factor

To the Editor of ELECTRICAL WORLD:

I am in receipt of your letter which has been forwarded to me by the editor of *The Electrician*, pointing out the apparent incorrectness of the formula in my article "Three-Phase Power Factor," published in *The Electrician* of Feb. 22, 1935. I would say that in the formula, as printed, the sign for addition was omitted, and that the correct formula should read:

$$\text{P.F.} = 0.5 + \frac{W_2}{W_1 + W_2}$$

Therefore, for example, the P.F. by this formula would be:

$$0.5 + \frac{1{,}400}{5{,}500} = 0.755$$

compared with 0.76 as determined by the usual "sum and difference" method.

A. G. POWELL,
Hillingdon, England.

BOOK REVIEWS

Heating and Air Conditioning

Published by McGraw-Hill Book Company, 330 West 42d Street, New York City. 444 pages, illustrated. Price, $4.

Those who contend that air conditioning is a phase of heating and ventilating will find those subjects here thoroughly identified with one another technically and thermodynamically. This revised text that has been in the forefront since its first appearance in 1918 has been extensively rewritten again to embrace two new chapters on air conditioning and its co-ordination with ventilating systems. There are other chapters on the unit forms taken by the equipment and the accessory processes of filtering, washing and humidifying. As a consequence nearly half the pages of the book deal with the principles and psychrometric and physiological information on which air conditioning applications are based.

The book is well illustrated and indexed and carries a substantial amount of tabulated and graphic data for design purposes.

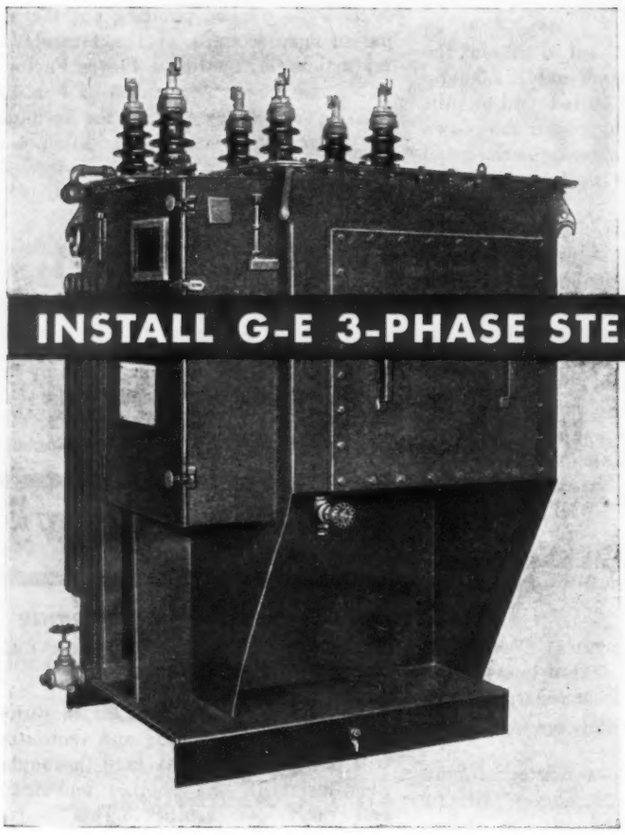
•

Jones' Estimating Tables

Published by Domestic Engineering Publications, 1900 Prairie Avenue, Chicago, Ill. 68 pages, illustrated.

Forty tables of coefficients, duct areas and register sizes are given for a wide variety of temperature differences and wall constructions as determining the installation of forced-air winter heating and air conditioning. The handbook should serve as a useful introduction to the more intricate problems of year-round and summer air conditioning. A closing ten-page chapter gives a complete solution for a fully detailed bungalow.

How to Regulate Voltage *Profitably* on high-voltage suburban and rural lines



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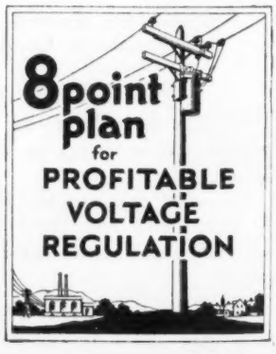
The step voltage regulator is one point of General Electric's 8 POINT PLAN for Profitable Voltage Regulation. The plan provides a complete line of equipment for practically every voltage-regulation problem. Write for our folder (GES-1142) which gives complete information on the economic soundness of voltage regulation. Address the nearest G-E office, or General Electric Company, Dept. 6A-201, Schenectady, New York.



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GENERAL ELECTRIC

ELECTRICAL WORLD

MANAGEMENT • ENGINEERING • OPERATION • UTILIZATION

PUBLISHED EVERY OTHER SATURDAY

SEPTEMBER 14, 1935

A New Concept of Growth

THE power industry is faced with a two-fold problem. Increased load must be developed. Public relations must be improved. But fortunately the two go hand in hand. Load grows only with an increased popularity for electric service. And when the use of electricity wins favor, so does the company that provides it.

Last week, at Bedford Springs, Pa., N. G. Reinicker, general manager of the Pennsylvania Power & Light Company, made a powerful presentation of this urgent theme before the Pennsylvania Electric Association. The business of the public utility, he said, now demands an intimacy of relationship with the consumer that has never before been envisioned or applied. For it is no longer enough merely to render a continuous service at reasonable rates. The need today is for an increased volume of business built to a greater magnitude and a faster progress than has been attempted in the past. Concurrently must come a closer understanding between the utility and the user of service.

The salvation of the power industry in its present difficulties lies in accelerating sales so that it may have the revenue required to carry increased taxes, lower rates and higher operating costs. It is a simple problem in principle. There must be enough income to pay the bills. And when the bills get bigger the only out is larger earnings. The greatest danger in the situation is the risk that the utilities will fail to recognize the urgency of action that is called for and to make adequate investments in man-power and commercial programs. If management plans in terms of just improving usual gains in new business, it will jeopardize both its financial security and public confidence.

THE situation demands a new concept of growth that will speed the development of all markets for electric energy in a wave of co-ordinated selling. It must build on ahead of the present burdens of cost and restriction and rear a structure of service for a greater expansion than had been previously planned.

We doubt if all utilities realize what can and should be done in sales today or apply the full knowledge available to their programs. In domestic commercial and industrial sales there is a new technique evolving. Ranges, for example, aren't sold just because a two-cent rate and dollar-a-month terms are available. It is the tangible and intangible levers of education, promotion and sales organization that move the ranges into the homes in volume, and keep them in use after they are sold. Personal contacts, direct and indirect promotion, demonstration, product and testimonial advertising, market analysis and forcible and intelligent application of the principles underlying good merchandising are brought into play. And in addition to adequate money and man-power, there must be that spirit of organized enthusiasm that fires the zeal of many men and makes them strong.

ELECTRIC service intimately involves the security as well as the peace of mind and comfort of every customer. As such, it has great friend-making power and there is also vast opportunity for misunderstanding and hurt feelings. Pennsylvania Power & Light Company personalizes its service by centering in one representative all functions of the utility in its dealings with the individual customer. He is the company. He makes the friend. He builds intimate and personal relations that in the mass create a better public sentiment and break down sales resistance. It symbolizes a company-customer accord, which must be a feature of any program of load building on the greater scale.

Business, it seems, is now to have a breathing spell. Certainly the curve of industrial and commercial volume is climbing. The American people are at last atune to progress, eager for the forward march of business up out of the valley. With the great present popularity of electricity as an agent of service to industry and to the home, there is no reason to falter or to fear. If electrical men will but build now on the scale of their opportunity, they will find the solution of their present problems easy, because their success will outrun their needs.

ORNAMENTATION MADE SERVICEABLE

Arch of the Future at San Diego Exposition exemplifies ultra-modern illumination for the sake of artistry. Built chiefly to house and conceal lighting units which set out surrounding buildings and trees, the arch disguises its function and adds luster doubled by tranquil reflection.

Controlled Atmospheres in Electric Furnaces

Quality Results Obtained by Performing Heat Treatment Under Controlled Conditions of Atmosphere in Several Varieties of Furnace

By GEORGE H. HALL
Consulting Engineer, New York

SINCE different metals and various processes of treatment require different gases or combinations of gases for attainment of the desired results, furnaces for this class of work may be classified under the general heading of "controlled atmosphere" furnaces. While the field of employment of controlled atmosphere furnaces is continually widening, a comprehensive understanding of this type of furnace may be gained by a consideration of the types employed for the principal methods of treatment to which they are suited. These methods may be classed as (a) carburizing and (b) nitriding for surface hardening, (c) precision tempering of the ferrous metals, (d) bright annealing and (e) brazing.

In the process of carburizing the carbon content of the surface layers of the material being treated is increased by heating in the presence of hydrocarbon gas, the usual carburizing temperatures ranging from 1,650 deg. F. (900 deg. C.) to 1,800 deg. F. (982 dec. C.).

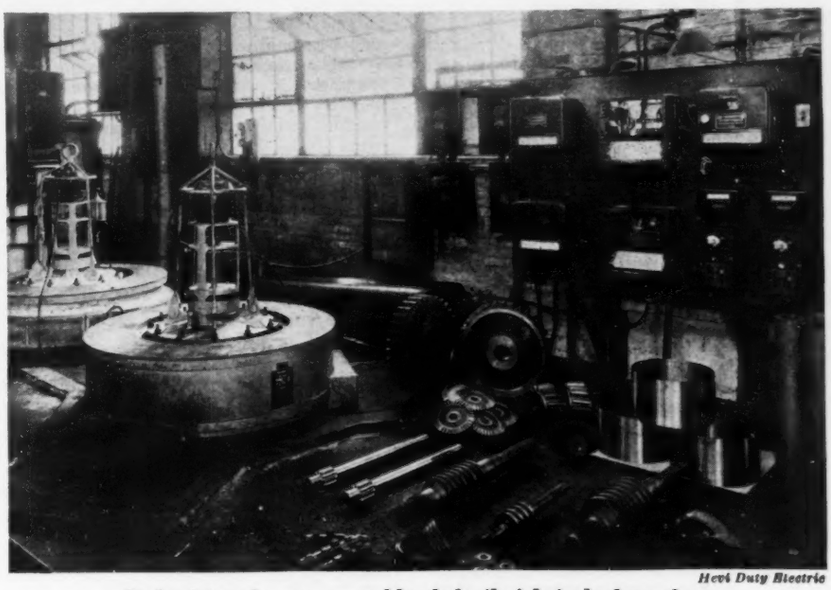
The primary factors in the process are the depth of the carburized portion or case, the amount of carbon introduced into the case and the gradation of the carbon content from the outer surface of the case to the core. The attainment of the desired results depends upon the composition of the steel, the carburizing temperature, the length of time allowed for the treatment and the nature of the carburizing material employed. While this indicates that casehardening to meet and duplicate established specifications is subject to careful study and experiment in the determination of procedures, the accurate control of all of the factors involved as provided by the electric furnace with atmospheric control has resulted in the development and application of casehardening to a degree far higher than has ever been obtained before.

The advancement in the refinements of carburizing with electric furnaces has now reached a point where the use of specifications for case structure are becoming general practice. Not only may these specifications call for a carefully controlled depth of case, but the case itself must meet definite requirements as to carbon concentration and gradation.

Carburizing may be performed by the use of commercial city gas or with certain kinds of natural gas, but in the use of any gas of this type, which is supplied primarily for its heat content, the chemical constituents may vary somewhat from time to time or may not be suited to the particular material to be treated or to the kind of treatment desired. As the control of the gas employed has equal importance with that of the control of the heat, the requirement of a gas that will at all times be uniform has resulted in the development of chemical mixtures which, when vaporized, will always produce known results.

A typical carburizing furnace (shown in the accompanying illustration) employs a special carburizing medium in the form of a blended oil which, upon vaporization, produces a gas uniformly rich in hydrocarbons and is especially suited to the carburization of steel.

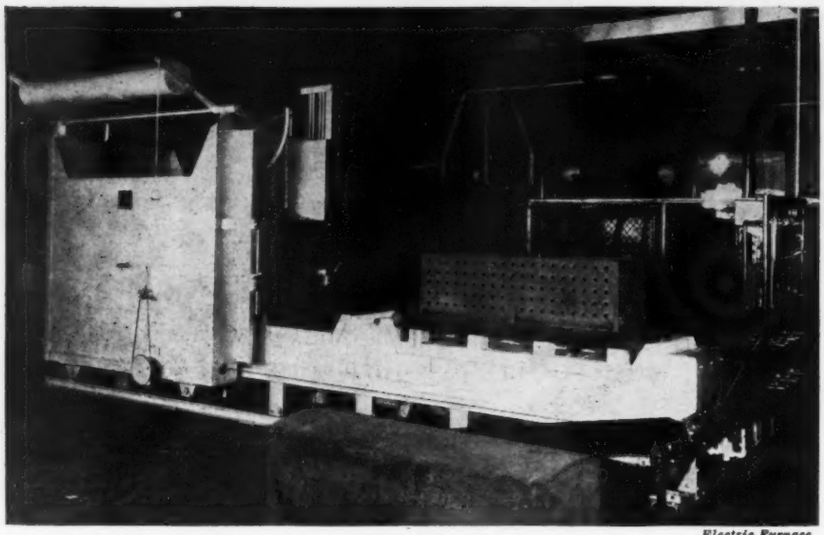
The process of nitriding—that is, adding nitrogen to iron base alloys by



Hevi Duty Electric

Carburizing furnace uses blended oil rich in hydrocarbons

The furnace itself is of the conventional pit type, having nickel chromium heating elements so arranged as to give two or three heating zones. The carburizing container or retort is located within the furnace chamber and is closed gas-tight by a cover upon which is mounted a vertical motor for the operation of the circulating fan. In the cover are oil inlet, gas outlet and thermocouple pipes. The fan, which is located under the cover, extends into the retort, in which, with the aid of a deflector, it maintains a circulation of the gas through the perforated or meshwork container in which the parts to be treated are placed. The carburizing liquid is dripped into the fan discharge and forced against the hot sides of the retort, where it immediately gasifies.



Electric Furnace

Nitriding furnace made semi-continuous

Two nitriding chambers mounted on a fixed hearth and permanently connected to ammonia supply. Underneath each chamber is a fan to insure circulation and to constantly bring fresh supply of ammonia gas to parts being treated. Each chamber provided with gas-tight cover tightly fitted over chamber after charge has been placed within it; retains gas in contact with charge, at same time preventing escape into heating chamber of furnace or into outside air.

Furnace proper, about half length of hearth, is mounted on wheels or rollers so that it may be easily shifted from its position over one of the nitriding chambers into position over the other. As process in one chamber is completed furnace is rolled into position over other so that nitriding in one chamber is going on all the time. Period of nitration sufficiently long to allow for cooling and recharging of first treated chamber while second is under treatment.

heating the metal in contact with ammonia gas or other suitable nitrogenous material—is employed for the surface hardening of steel, or case-hardening. For use in shops in which the amount of nitriding is comparatively small the ordinary box type of electric furnace may be used by the addition of an equipment consisting of an ammonia cylinder, a nitriding box and suitable piping with pipette and pyrometers for controlling the ammonia gas and the furnace temperature. The parts to be nitrided are placed in the box, which is gas-tight, and provided with inlet and outlet tubes for circulating the ammonia. This is inserted in the furnace, the furnace door closed and its temperature regulated closely at about 950 deg. F. (510 deg. C.) for a period of 24 to 90 hours, depending upon the depth of the case desired.

For nitriding on a larger scale nitriding furnaces, operating in the same manner as above, are simply modifications of the box furnaces, but incorporating the nitriding chamber as a permanent part of the furnace and providing ready means, such as rolling hearths, for moving the nitriding chamber in and out of the furnace. A nitriding furnace for semi-continuous operation in production work is illustrated herewith.

Development of the electric furnace with atmospheric control has resulted in an advance and improvement in the treatment of alloy steels, especially the high-speed tool steels, far beyond that which was possible of attainment with the older types of fuel-fired furnaces.

Whenever steel is raised to a hardening temperature, which may run as high as 2,400 deg. F. (1,315 deg. C.), it is subject to surface attacks such as scaling, pitting and decarbonization, all of which are caused by surface oxidation which occurs when the treatment is carried on in normal atmosphere. It was early found that these troubles could be largely if not wholly eliminated if the steel were treated in a neutral atmosphere—that is, one devoid of oxygen—and while a certain degree of success was obtained by modifications of the fuel-fired furnaces that provided such an atmosphere it was only with the introduction of the electric furnace that the full advantages of controlled atmospheres became available.

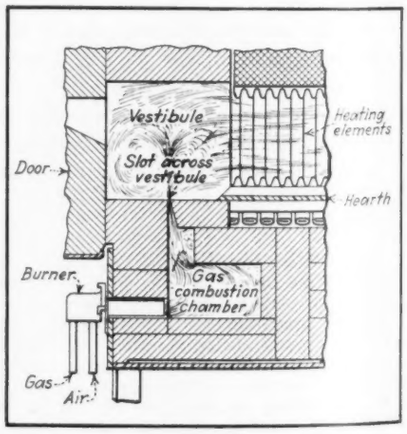
The furnaces for the heat treatment of tools and steel parts are similar in construction to the conventional types of box furnaces but with the added features necessary to provide the protective atmosphere.

A further wide field for the employment of the electric furnace using non-oxidizing or controlled atmosphere is found in the process of bright annealing of both the ferrous and non-ferrous metals. By its use steel and many of the non-ferrous metals may be subjected to heat treatment without any resulting oxidation, so that subsequent pickling and washing are entirely eliminated. When annealed in the presence of controlled atmosphere not only does the work retain its original bright finish and smooth-rolled or drawn surface but the elimination of pickling obviates the possibility of acid embrittlement, which, in treatment requiring subsequent pickling, is often the cause of much trouble.

For the treatment of the ferrous metals bright annealing is finding an increasing field of application in the annealing or normalizing of cold-rolled strip steel, sheet steel, wire, tubing and rods, while for the non-ferrous metals it is being used in the annealing of copper wire, both in coils and on spools, copper tubing, copper strip, nickel silver flat ware blanks, and silver.

Bright annealing is usually a quantity production process, the more generally employed types of furnaces being those providing for continuous or semi-continuous operation. Wire, strips and punchings are treated in conveyor, roller hearth or pusher types of furnaces which are similar to those operating with normal atmosphere, except that they are gas-tight in construction and provision is made for supplying them with the non-oxidizing atmosphere. For many classes of work the furnaces are also provided with cooling chambers operating with controlled atmosphere, while for such work as requires quenching a quench tank is incorporated as a part of the furnace. Thus the entire process of heating, cooling and quenching is performed with the work at no time exposed to the presence of normal or oxidizing air, while its temperature is sufficiently high to permit surface oxidation.

Since the development of the con-



Combustion chamber separate in tempering furnace

Separate combustion chamber located below furnace. As gas burner is supplied with both gas and air connections the relative proportions of each as supplied to combustion chamber are accurately regulated. From combustion chamber products of combustion forming controlled atmosphere flow up across front of furnace chamber. Sufficient amount of gas is employed, first to displace all normal atmosphere in heating chamber, and then to provide invisible screen or curtain through which outside air will not penetrate when furnace doors are opened for inserting or removing charge.

trolled-atmosphere electric furnace an entirely new field for its use has been opened up. This is for the brazing of parts that would be expensive to produce as single pieces and are therefore made in two or more separate parts. These parts were formerly joined together by torch welding, soldering, riveting or crimping, all of which were comparatively costly and the results frequently far from satisfactory. In the operation of the new process the parts to be united are pressed together and passed through an electric furnace in which the controlled or reducing atmosphere acts as a flux. There the brazing metals, which have been applied when the parts were assembled, melt and flow into all joints by the aid of capillary attraction. The parts to be brazed should be assembled with a light press fit, since a tight fit does not inhibit the flow of the metal, but rather insures deep penetration of the brazing material into the joint.

Electric brazing is used for uniting parts of steel, copper-coated steel, copper or brass, and as the process permits the brazing of parts of different composition it is successfully used in the manufacture of cutting tools where a cutting edge of a special carbide steel is brazed to a tool body of carbon steel.

The parts having been assembled, the brazing material is applied in the form of wire or strip. Where the joints are inaccessible to the application of solid material it may be used in the form of a powder or paste. The parts are then placed in the furnace and subjected to a temperature sufficiently high to melt the brazing material, but below the melting point of the parts themselves. This involves the choice of brazing media of different melting points for the various metals with which they are used, the most generally used brazing materials being:

	Melting Point
Silver solder	1,400°F. (760°C) to 1,600°F. (871°C.)
Brass wire	1,740°F. (949°C)
Brass powder	2,000°F. (1,093°C.)
Pure copper	2,100°F. (1,149°C.)

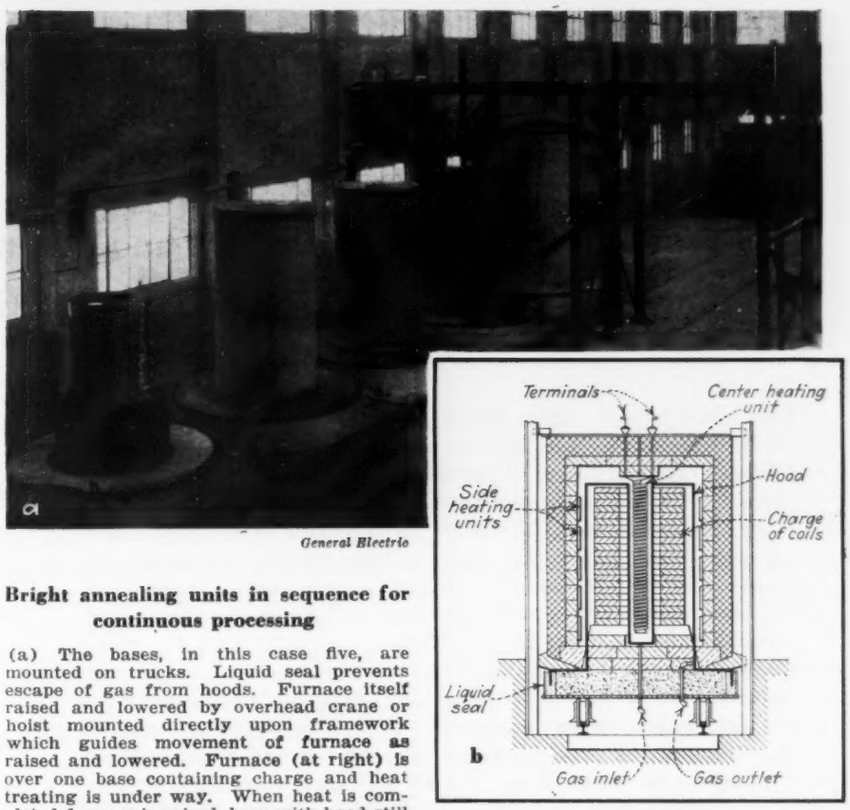
For brazing on a small scale furnaces similar to the conventional box furnaces are employed. Such furnaces are provided with two chambers, one for heating and the other for cooling, both operated with controlled atmosphere. With such furnaces the operation is necessarily intermittent as the charge must be transferred from the heating to the cooling chamber as the work progresses. For quantity production the brazing furnaces used are most generally of the conveyor type.

There are a number of gases suitable for use with controlled-atmosphere furnaces and the choice generally depends upon the cost, which in the case of natural or city gases will, in their turn, depend upon the location of the plant in which they are to be used. By a partial combustion of city or natural gas an atmosphere suitable for use in the furnace is obtained in an increased volume, and at consequently reduced cost, over that entailed by the use of the commercial gas direct. For low-temperature applications, however, the use of uncombusted city or natural gases may be most desirable.

When a large amount of production is being carried on the gas is usually prepared at the plant where it is to be used by means of an atmosphere controller or producer. Disassociated ammonia gas (75 per cent hydrogen, 25 per cent nitrogen) may be prepared on the job by cracking anhydrous ammonia, as purchased in cylinders, at a temperature of 1,500 deg. F. (815 deg. C).

While accurate figures cannot be given for the different gases at all times and at all localities, the following table, giving approximate cost per thousand cubic feet, will furnish a guide as to the relative costs:

	Cost per M Cu.Ft.	
Hydrogen (in pressure tanks)	$10.00	25.00
Nitrogen (in pressure tanks)	10.00	25.00
Disassociated ammonia	1.50	4.00
Electrolene (trade name)	0.60	1.00
City gas (for low-temperature applications)	0.40	1.00
Natural gas (for low-temperature applications)	0.20	0.60
Products of partial combustion of city gas	0.12	0.35
Elfurno (trade name)	0.15	0.25
Products of partial combustion of butane	0.10	0.20
Producer gas	0.05	0.15
Products of partial combustion of natural gas	0.04	0.15



General Electric

Bright annealing units in sequence for continuous processing

(a) The bases, in this case five, are mounted on trucks. Liquid seal prevents escape of gas from hoods. Furnace itself raised and lowered by overhead crane or hoist mounted directly upon framework which guides movement of furnace as raised and lowered. Furnace (at right) is over one base containing charge and heat treating is under way. When heat is completed furnace is raised, base with hood still in place is drawn out onto track and furnace is ready for another charge. In the meantime charges already treated are cooling, still in controlled asmosphere, which is maintained throughout entire process of both heating and cooling. As time of heating is from six to fourteen hours, depending on weight of charge, thickness of strip, soaking time desired, etc., and that of cooling is from 30 to 40 hours, over-all treatment lasts from 36 to 54 hours, but as sufficient number of hoods is provided to allow for cooling, unloading and loading, process is continuous. Three bases with hoods in place are shown (center). These are undergoing cooling while last base (left) has treated and cooled charge in place, hood having been removed for discharging. As soon as this is completed the empty truck will be returned to right-hand end of line, recharged, hood replaced, ready for heating as soon as heating in base now under furnace is completed.

Gas inlets and outlets are provided in the bases so that gas may be fed into the hoods throughout the entire process and no artificial atmosphere is at any time introduced into the heating chamber proper.

(b) shows a section through such a furnace and also indicates the introduction of a center heating unit in addition to the usual side wall units.

For special kinds of work the bell furnace arrangement described above may be somewhat modified so as to handle charges other than rolled strip material, but the principle of using a single heating furnace and several cooling hoods is retained. Elevator types of furnaces are employed in a similar manner for the treatment of metal sheets and punchings.

Lower Cost Wiring

Contribution of Electricity to the "More Abundant Life" Is Restrained by Cost of Appliances and Wiring—Rate Cuts May Cripple Utilities, but Still Fail to Multiply Energy Usage

The federal administration has suggested bringing commodity prices to 1926 levels, but the national average household rate for electricity is now more than 18 per cent below 1926. And it should be noted that reductions in electric rates have been made possible primarily by developments in the art accomplished by the public utilities themselves. There are many indications that the margin for further electric rate reductions is fast disappearing in most localities, and several recent rate reductions will be confiscatory if substantial added business is not obtained. Looking after the public interest in utility matters is therefore carrying state commissions into the field of promoting lower cost wiring and appliances where the possibilities appear important. This article is a very positive exposition of the point of view of an engineer and a forward-looking regulatory commission. Not all will agree with his statements, but he opens up a promising development in a fearless manner.

By J. C. DAMON
Chief Engineer Public Service Commission of Wisconsin*

WITHOUT appliances to use electricity and without wiring adequate for these appliances no amount of reduction in rates can give the people that "larger life" electricity promises them.

With wiring and appliances at prices that users can afford to pay they will use more electricity and move into the lower blocks of present-day rate schedules, thus getting automatically rate reductions many times greater than the most active and powerful regulatory commission might impose.

The advent of really low-cost appliances and an economical wiring system would eliminate a lot of unemployment by tapping that great reservoir of under-wired homes and other buildings which have accumulated a deficiency in wiring below the modern standard of adequacy, nearly equal to all the existing wiring in place. It would also permit wiring many an old house in which the investment in adequate wiring of the present inordinately expensive type could not be justified.

When we face the facts we find the customer's investment necessary to make use of electricity is a much greater factor than the present cost of electricity itself. This appears clearly in the accompanying Table I of costs of electricity and of appliances to use it. It should be remembered that appliances come in many sizes and qualities and the figures given in the table do not cover drug store sale prices nor what may be paid for fancy or super-size appliances. The average investments are intended to be representative of what the actual purchases may amount to from responsible appliance sales agencies.

Looking at the first and second columns of figures in the table, it will be seen that in the small appliance class, for which the normal cost per month of operating the group is estimated at $1.58, the lowest appliance investment is 110 times the monthly operating cost. In the four heavier use appliances the estimated monthly operating cost of the group is $6.735 and the investment is 71 times as much, while for the water heater the investment is 40 times as much as the monthly operating cost. If average cost of high-grade appliances as shown in the last column is considered, the ratio becomes even more impressive.

Wiring cost an equal deterrent

Several appliances may be used from time to time in different locations and some may be used at different times in the same outlets, so that it is difficult to estimate any cost of wiring for the appliances listed in the table, but not one house in a hundred today is wired to use even half of them in a convenient manner, and the list is by no means complete.

While appliances can go with people when they move, the house wiring must stay with the house. In consequence, there is a large proportion of the public today who do not feel secure enough to invest in expensive wiring, but who will buy appliances and extension material at the 5-and-10-cent stores and get along with inconvenient and unsightly connections to existing inadequate wiring.

The cost of permanent house wiring without lighting fixtures, but including switches and convenience receptacles, varies from $2 to $10 per outlet (counting switches as outlets), depending on the type of house, type of installation and the local ordinances and rules, and whether adequacy from the standpoint of voltage drop is required or only safety as prescribed by the National Electrical Code and local ordinances. When it comes to heavy circuits for ranges and water heaters, the cost varies from $10 to $60 per installation.

Suppose we think about the Federal Power Commission's typical dwelling of five rooms and give it the minimum wiring of a "built-to-sell" or "built-

*From paper "The Effect of the High Cost of Wiring and Appliances on the Use of Electrical Energy," at thirteenth annual Conference of Utility Commission Engineers, Washington, D. C.

to-rent" house, with a light in each room and switches in three of the rooms, making eight outlets, and one convenience outlet in each of three of the rooms, two lights and a switch for the cellar, one light and a switch for the attic and a light and a switch on the porch and the same in the hall, making twenty outlets and a service entrance and switch.

Taking $2 per outlet and $20 for service entrance and switch gives a cost of wiring (all No. 14 wire) of $60. Such a house might be expected to average 15 kw.-hr. per month and have a peak load of ¼ kw. In this case the customer's wiring cost is $240 per kilowatt of his own demand, and considering the great diversity factor, it is probably $500 per kilowatt of capacity required at the power plant. The capacity at the power plant for large developments is now around $100 per kilowatt, or one-fifth of the wiring investment.

The wiring in this house would be adequate for a greater use if fully used, say, for 25 kw.-hr. per month and a demand of ½ kw., in which case the user's investment might be only 2½ times the main power plant investment. Beyond this use of electricity there would probably be needed more outlets, which might have been obtained when the house was built, say ten more outlets at $20, making the total $80 for 30 outlets (all No. 14 wire), but no provision for heavy-duty appliances. To put these ten more outlets in after the house was completed would cost at least $50 on an average, and the result is that probably $5 worth or less of 10-cent store flexible cord and fittings would be used around the house if a family desiring to use 40 kw.-hr. per month lived there.

If an electric refrigerator should be installed in this house and connected to an existing convenience outlet, it would probably be a constant aggravation to the radio and to any lamps plugged into outlets on its circuit because of the voltage drop in the wiring.

In most states the power companies are required to maintain high standards of regulation at the entrance to the house, which is wasted effort, with inadequate wiring to start with and a lot of 10-cent store extensions added.

Wiring for such a house laid out for not more than 2 per cent drop at full load on any circuit and providing for the modern standard of lighting, a refrigerator and small appliances would take 40 outlets and cost from about $100 minimum up to $250, according to location and rules applying.

Even on the lowest costs the customer's wiring is a bigger factor of investment per kilowatt of generating capacity than the main generating station capacity, and even when the simplest lighting fixtures with lamps and the cheapest appliances are used the customer's total investment will exceed his proportion of the investment in the entire power system, including generation, transmission and distribution.

Table I—Cost of Electricity and of Appliances to Use It

Appliances	Electricity Cost per Mo.*	Investment in Good Quality Appliances Low	High	Average
Curling iron	$0.04	$1.95	$4.95	$3.00
Heating pad	0.04	3.50	8.50	5.00
Clock	0.06	3.95	40.00	5.00
Waffle iron	0.08	4.95	16.95	10.00
Washing machine	0.08	49.50	110.00	75.00
Space heater	0.12	3.95	15.00	6.00
Kitchen mixer	0.12	18.95	25.00	22.00
Vacuum cleaner	0.12	29.50	59.50	40.00
Flat iron	0.16	2.95	8.95	5.00
Toaster	0.16	2.95	14.50	5.00
Percolator	0.16	5.95	15.00	7.00
Sandwich toaster	0.16	6.55	15.00	8.00
Radio	0.28	39.50	300.00	60.00
Sub-total	$1.58	$174.55	$633.35	$251.00
Iron machine	$0.315	$39.95	$110.00	$60.00
Oil burner	0.60	250.00	500.00	300.00
Refrigerator	1.44	99.50	400.00	160.00
Range	4.38	89.50	300.00	125.00
Sub-total	$6.735	$478.95	$1,310.00	$645.00
Water heater	2.50	100.00	300.00	150.00
Grand total	$10.815	$753.50	$2,243.35	$1,046.00

*Rate for small appliances taken at 4 cents per kw.-hr., for major appliances at 3 cents and for water heater at 1 cent

Expensive wiring delays adequate wiring

That the existing costs of wiring have led to the continuance of inadequate wiring is amply proved by the fact that manufacturers estimated for the Edison Electric Institute that 25 per cent of their production of flexible cord in green twisted pair and parallel silk-covered lamp cord was marketed through chain stores (mostly 5-and-10-cent stores) and half of this was sold assembled with fittings as extension cords. In addition great quantities of all rubber flexible cords are being sold in the same channels in the form of assembled extensions.

So long as the cost of wiring prevents houses from being wired adequately and forces the continued use of inadequate wiring the people will be denied that "larger life" which electricity might give and reduced rates for domestic service will not accomplish their intended full purpose.

It is common knowledge that reduction in rates usually leads to increased use of electricity, but that has not been always so during this depression. Much of the increased use has been merely a relaxing of the customer's vigilance and the abandonment of low-wattage lamps when they burned out and replacement with higher wattage lamps rather than any substantial new uses which would call for more adequate wiring.

Let us see what has been happening to the cost of wiring while electric rates have been going down. In a certain locality in Wisconsin where electric ranges have been installed for more than fifteen years I have been furnished with the detailed costs of the wiring in place from the service entrance through the entrance switch and meter (not including the meter) to the range as permitted and installed in 1920, but using a 1935 price basis to eliminate the effect of price level changes, also the price of a conventional installation as required in 1935. The details appear in Tables II and III.

The earlier required installation would cost $28 at today's prices, while the present conventional required installation costs $46.19, an increase of 65 per cent in fifteen years, during which the nation's average household cost of electricity has gone down 20 per cent. The earlier installations are still functioning as well as the new ones and have not caused fires or accidents.

Is this 65 per cent increase in cost of wiring which has been brought about by the National Electrical Code and local ordinances justified or necessary?

Within the last few weeks, and not yet published, the N.E.C. has permitted extension of the use of bare neutral service type cable for electric range wiring. This will reduce by about $12 the conventional 1935 cost shown above, making it $34, or only 21 per

Table II—A Typical 1920 Range Installation Figured on 1935 Prices

		Invoice Unit Cost	Extension
150 ft.	—No. 6 R. C. stranded copper wire	$3.64*	$ 5.46
20 ft.	—½-in. loom	3.66*	0.73
24	—Porcelain "Nuilit" knobs —for No. 6 wire	2.40†	0.58
1	—4x12x15-in. steel box	2.02‡	2.02
6	—A-5 porcelain bushings	0.10‡	0.60
1	—60-amp. 3-pole slate base, knife switch (fuseless)	2.68‡	2.68
1	—3-pole, 60-amp. cartridge fuse cutout	1.68‡	1.68
3	—60-amp. cartridge fuses	0.14‡	0.42
	Total material		$14.17
	10% stores, freight and handling		1.42
			$15.59
	8 hours labor at 60 cents		4.80
	8 hours car expense at $2 a day		2.00
			$22.39
	25% for overhead and profit		5.60
	Total retail cost		$27.99

*Per hundred ft. †Per hundred. ‡Each.

cent over the 1920 requirements, provided local ordinances do not interfere.

This concession for the use of bare neutral non-metallic sheathed cables for entrance services and range wiring has been won after much hard fighting, carried on mostly by the public utilities, originally through their National Electric Light Association and later through their Edison Electric Institute and Association of Edison Illuminating Companies. The utilities have long realized the effect of the high cost of wiring on the ability of people to use electricity.

The Edison Association bare neutral system was developed to cut the cost without sacrifice of safety, and with great difficulty permission was obtained to install about 1,000 examples of this system in the United States. This was not enough to obtain standard prices in manufacture, and as the installations were made in many parts of the country the workmen were all unfamiliar with the installation and in some cases hostile to it.

The Underwriters' Laboratories reported on these installations and found nothing to criticise on safety. They found by-path currents small and without any effect respecting service, corrosion, arcing, heating, fire or accident hazards. Notwithstanding all this, the N.E.C. still requires the utterly absurd full insulation of the neutral, which is then thoroughly grounded, making the high insulation useless. Service entrances and range wiring are the only exceptions where bare neutrals have very recently been permitted by the N.E.C., and there are thousands of laws and local ordinances which will neutralize this advance until they are repealed.

While the N.E.C. does allow under some circumstances knob and tube wiring and BX cable wiring, the code is so written that rigid iron conduit is highly preferred and often required. All approved switch and junction and outlet boxes are designed to have strength based on the stresses due to rigid iron conduit. A large proportion of the users of electricity live where local ordinances eliminate some or all of the less expensive N.E.C. forms of wiring in favor of full rigid iron inclosure of the wiring.

These rules, codes and laws have driven the cost of wiring ever upward, and this rise in cost has already reached the point where even new houses in general are not now wired to permit the reasonable enjoyment of low-cost electricity when it is made available.

The cost of present-day wiring could and should be cut to one-quarter of what it is without any appreciable increase in hazard of any kind, and this would result in a material decrease in the present hazard from 10-cent store extensions.

How? There will be a hundred ways if the field is ever opened to the inventive genius of America, but to suggest specifically a way I will outline a possible system which is not my own invention or pet scheme, but draws on well-studied plans of others which appeal to me.

To start with, use the present approved switches, sockets, receptacles, etc., with designated polarity, but throw out conduit entirely and substitute for the heavy steel boxes at outlets cheaper, lighter stamped metal (galvanized, if necessary) boxes to inclose the outlet fittings and hold the ends of the bare neutral wiring. Bakelite, porcelain, asbestos or other insulating material boxes could be as well used if cheaper and not combustible.

For two wire branches use conductor made as follows: At the center a seven-strand tinned conductor of No. 12 or larger (eliminate all No. 14 wire) covered with a thin high-grade rubber insulation. Spiraled on the rubber a single unlapped tape or impregnated paper layer and over this a stranded tinned bare neutral equivalent to No. 12 or larger to match the center insulated conductor. Over all a weatherproof braid. This No. 12 double conductor should go easily through a ⅜-in. hole and quite probably through a ¼-in. hole and stand all the tests on the center wire that any N.E.C. insulated wire should stand. The braid over the bare neutral is for mechanical protection only and might be flameproof instead of weatherproof if desired. This conductor with bare grounded neutral outside the insulated conductor needs no insulated support and can be buried in plaster or strung anywhere where it will not be subject to mechanical damage.

For three-wire circuits with bare neutral two conductors would each be No. 12 or larger seven-strand tinned copper wire covered with a thin high-grade rubber insulation. These two conductors laid parallel would not require the tape suggested around the insulated conductor in the two-wire combination. The bare neutral could be laid in their cusp, separated from them by a narrow strip of impregnated paper to prevent the strands of the neutral from cutting into the insulation on the two insulated wires and the whole combination inclosed in a braid.

This three-conductor combination in the No. 12 size would go easily through a ⅜-in. hole. It would need no insulated support and could be strung wherever it would not be mechanically damaged.

These types of conductors could be made in any size required by the load, supported where necessary by metal or composition clips, and run continuously from outlet to outlet or junction box. Where the wiring would not be mechanically protected by being con-

[*Continued on page 69*]

Table III—A Typical 1935 Range Installation

		Invoice Unit Cost	Extension
80 ft.	—No. 6 R.C. stranded copper wire, black	$3.64*	$2.91
45 ft.	—No. 6 R.C. stranded copper wire, white	3.64*	1.64
18 ft.	—No. 8 3/c BX cable	13.30*	2.39
30 ft.	1-in. conduit	14.06*	4.22
1	—1-in. T condulet and cover	96.60†	0.97
1	—1-in. E condulet and cover	71.00†	0.71
3	—1-in. 90 deg. bends	27.96†	0.84
4	—1-in. Couplings	10.96†	0.44
3	—1-in. Lockouts	1.72†	0.05
3	—1-in. Bushings	3.32†	0.10
8	—1-in. Straps	1.50†	0.12
4	—¾-in. BX straps	1.00†	0.04
2	—¾-in. Connectors	13.00†	0.26
2	—50-amp. cartridge fuses	0.14‡	0.28
2	—60-amp. cartridge fuses	0.14‡	0.28
1	—Ground clamp	26.50†	0.27
1	—Copperweld ground rod	1.43‡	1.43
1	—Entrance switch as now furnished for range installations	5.82‡	5.82
	Total material		$22.77
	10% stores, freight and handling		2.28
			$25.05
	14 hours labor at 60 cents		8.40
	14 hours car expense at $2 a day		3.50
			$36.95
	25% for overhead and profit		9.24
	Total retail cost		$46.19

*Per hundred feet. †Per hundred. ‡Each.

Compensating Metering Saves

Secondary Meter Registers Transformer Loss as if Metered on Primary Side

By WALTER C. WAGNER
General Superintendent Meter Division, Philadelphia Electric Company

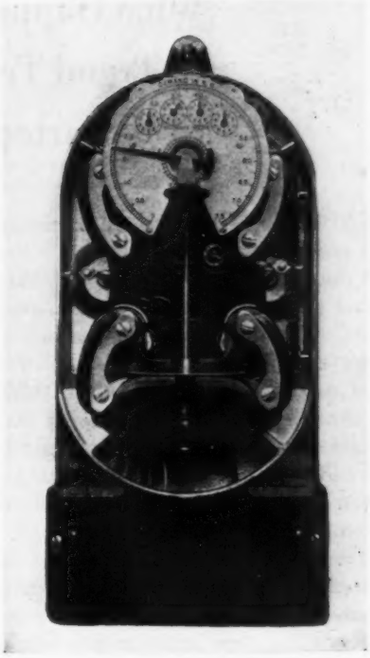
SEVERAL years of practical service experience indicate definite construction savings by the utilization of compensating metering,* developed by the meter division of the Philadelphia Electric Company and now a product of several meter manufacturers. Installations of such compensating metering, using a supplementary meter on the secondary side to indicate losses in transformers and lines, have multiplied to the extent that average values of savings as compared with primary metering can be cited. None of the figures in the accompanying table are extremes, and therefore the indicated average economies are conservative. Many special cases show greater savings. The savings in cost are seen to be small for primary voltages of 2,300 and 4,000, but begin to be sizable at 13,800 volts and have run from $2,400 on 33 kv. to over $50,000 on a higher voltage installation.

In addition to the direct construction savings, there are other advantages: (1) Elimination of meter and instrument transformer damage by lightning disturbances on the primary supply, (2) sustained revenue through maintained service continuity, (3) safety to linemen through the elimination of primary metering complexities of construction, (4) safety to metermen by the exclusion of primary voltages from metering installations, (5) greater accuracy in registration at low loads and the generally consequent low primary power factors, (6) a direct index of transformer and line loss associated with delivery of useful energy, (7) savings in space requirements and (8) the possibility of eliminating outdoor pole-type metering. If desired, copper losses in all or part of the primary and secondary supply lines can be registered along with those in the power transformers themselves.

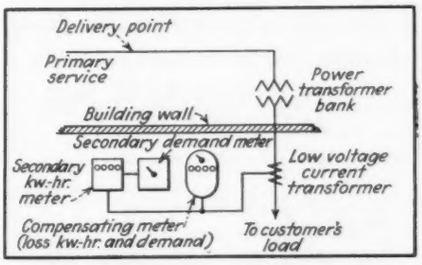
The limitations which have been encountered in this new practice are few. Should the transformers be changed in size or a different combination of transformers or windings be used, a recalibration of the compensating meter is necessary. Also, an additional compensating meter would be required for each additional transformer bank if more than one bank serves the customer independently. The savings and other advantages have, however, proved more than ample to offset these situations. Incidentally, commercial departments welcome the additional loss information made available as an aid in assuring the highest service economies for customers.

Where a single primary maximum demand is required for billing it is

[*Continued on page 84*]



Compensating meter in single-phase form



Scheme eliminates high-voltage instrument transformer

Compensating meter installed in conjunction with secondary watt-hour meter (left) and secondary demand meter gives all information for primary demand and consumption at primary side of power transformers.

*ELECTRICAL WORLD, July 1, 1933, pages 27-29.

Average Savings by Using Compensating Meters on New Installations

Metered at voltage of		230	230	230	460	2,300	2,300/4,000	13,800	13,800
Number of phases		3	2[1]	2[2]	3	2 or 3	3	3	3
System		3-wire	5-wire	5-wire	3-wire	3-wire	4-wire	3-wire	3-wire
Location of instrument transformer		Indoor	Indoor	Indoor	Indoor	*	*	*	†
Primary voltage	Location of instrument transformer	Cost in dollars less than for primary metering							
2,300/4,000	Outdoor	55	25	....	....	....	....	....	....
13,800	Indoor	500	475	325	455	470	240	....	....
13,800	Indoor with p.t. fusing	680	650	500	630	645	415	....	....
13,800	Meter house	600	575	425	555	570	340	....	....
13,800	Meter house with p.t. fusing	780	750	600	730	745	515	....	....
13,800	Outdoor	370	345	195	325	340	110	....	....
13,800	Outdoor with p.t. fusing	550	520	370	500	515	285	....	....
33,000	Outdoor	2,150	2,120	1,980	2,100	2,120	1,890	1,660	1,480
33,000	Outdoor with p.t. fusing	2,430	2 400	2,250	2,380	2,400	2,170	1,940	1,750

[1]Up to 400 amp. [2]Above 400 amp. *Based on average cost of indoor and outdoor types of installation. †With potential transformer fusing.

Industrial Power Survey

What Happened to Industrial Plants in 1933 and 1934 —Trend Toward Utility Power—Many New Industries Started—Comment on Sales and Competition

INDUSTRY data about industrial power have been meager. To find these data ELECTRICAL WORLD asked the major utilities some questions. Replies were received from 49 large utilities representing an industrial power output of 10,000,000,000 kw.-hr. a year, or about 25 per cent of the industry. These data apply to all industrial plants of 50 hp. and larger and come from all sections of the country.

The first question dealt with the changes that occurred in the industrial plants that already existed in the territory. Did they start or stop manufacturing? Did they shift from or come to utility service? Did they put in private plants? The data are summarized in Table I.

These data show very clearly that (1) older industrial plants in utility territories shifted to utility service in greater numbers than they left utility service; (2) the largest number of plants and greatest users of power used utility service during the depression; (3) the trend during the depression was to increased industrial power use and to increased utility service. So far as existing industries are concerned, the utilities have more than held their own against the depression and private plant competition.

What about new industries?

A second question dealt with the growth of new industrial enterprises in the territories of the utilities. These did not exist at the end of 1932, but were built or went into operation to manufacture a new type of product in 1933 and 1934. General opinion has existed that there were but few new industries, and many reports prevailed that new industries were using many power plants of their own. A summary of the data with respect to this situation is found in Table II.

From the data available it is evident that utility service has more than held its own in volume of business. More than this, there has been an appreciable growth in the number of new industries. It is worthy of note also that half of the industrial plants using their own stations put in steam equipment and used process steam. The remainder used Diesel engines with four or five gas engine plants.

To show the total changes in the industrial plants existing at the end of 1932 and of the new industries going into operation since that time the data of Table III are presented.

Private plants include the total of industrial plants abandoning utility service. Undoubtedly many of these establishments went out of business in this period instead of installing private plants. But the data do show that there has been a growth in industrial use, in the number of industries and in the use of utility service. Since these data are representative and involve at least 25 per cent of the industrial power, they may be taken as indicative of national conditions.

About sales conditions

Is competition increasing with respect to private plants? Twenty-five replies are "yes" and 22 are "no." This would indicate local variables and individual opinions govern, but on the whole competitive conditions are not changed.

This is supported in the replies to the question as to whether industrial private power plants in these territories were old or worn out. Nineteen said they were, but 21 said they were not. Here again local conditions fix the answer.

Another question was, "What industries are difficult to sell utility power?" Typical replies are as follows: Those lacking economic knowledge; process steam users; waste heat industries; textile finishing; cement plants; very high or very low load factor industries; ice; laundry;

Table I—Changes in Industrial Plants Already Existing in 1932 (49 Utilities)

	1934	1933
A. Plants Wholly Served by the Utility		
Number	14,390	14,211
Kilowatt-hours used	7,688,218,000	7,361,025,000
B. Plants Using Supplementary Service		
Number	807	799
Kilowatt-hours used	959,633,000	836,026,000
C. Plants Added to Utility Service		
Number	94	64
Kilowatt-hours used	53,558,000	32,946,000
D. Plants Added to Supplementary Utility Service		
Number	23	20
Kilowatt-hours used	12,448,000	6,220,000
E. Plants Abandoning Utility Service		
Number	58	77
Kilowatt-hours used	56,418, 000	60,748,70
F. Plants Shifting to Partial Service		
Number	10	7
Kilowatt-hours used	8,730	14,632

Table II—Power Data on New Industries Starting in Utility Territories in 1933 and 1934 (49 Utilities)

	1934	1933
A. Plants Added to Utility Service		
Number	292	227
Kilowatt-hours used	121,428,000	77,069,000
B. Plants Added to Supplementary Utility Service		
Number	10	12
Kilowatt-hours used	4,946,000	7,449,000
C. Plants Using Their Own Stations		
Number	15	12
Kilowatt-hours used	15,190,000*	4,185,000

*Nearly half of the use resulted from the building of one industrial plant using process steam and a large proportion of the rest was in the territory of one reporting utility.

Table III — Total Industrial Business Changes in Utility Territory in 1933 and 1934 (49 Utilities)

	1934	1933
A. Plants Served by Utilities		
Number	15,499	15,244
Kilowatt-hours used	8,774,225,000	8,281,561,000
B. Private Power Plants		
Number	83	96
Kilowatt-hours used	71,608,000*	64,933,000

*See note on Table II.

Table IV—Energy Sales and Power Sales Organization for Typical Utilities

No.	Industrial Energy Sales (1,000 Kw.-Hr.) 1934	1933	Number Sales Dept. 1934	1933	Annual New Business (1,000 Kw.-Hr.) 1934	1933	Annual Expense, Dollars 1934	1933
1	40,794	40,388	3	3	2,469	2,779	.....	.....
2	114,300	114,800	1	1	2,800	6,700	4,700	4,800
3	102,650	118,940	4	4	4,000	11,000	23,000	22,000
4	53,089	47,299	1½	1½	3,500	4,500	3,000	3,000
5	42,960	33,495	4	4	4,500	3,000	25,000	25,000
6	649,396	639,336	11	11	30,504	74,055	.....	.....
7	900,000	855,000	29	29	70,000	52,000	110,000	128,000
8	31,350	24,300	1	1	2,282	630	.....	.....
9	230,700	242,213	6	6	5,000	3,500	16,800	16,800
10	148,223	163,749	2	2	3,000	2,000	6,000	6,000
11	2,430	2,349	3	3	220	200	.....	.....
12	123,151	105,640	5	5	10,035	9,385	9,800	9,800
13	833,690	648,569	11	11	80,000	50,000	50,000	50,000
14	420,740	320,733	20	14	73,975	24,238	.....	.....
15	13,500	12,000	1	1	1,500	.....	1,500	500
16	5,600	5,100	1	1	1,400	2,200	6,269	5,700
17	42,234	40,628	4	4	3,500	4,000	9,600	10,200
18	50,729	54,348	1	1	211	0	4,300	6,200
19	50,804	53,424	5	5	229	445	.....	.....
20	20,666	17,857	2	2	500	50	2,400	2,400
21	685,162	714,148	11	12	32,516	16,793	.....	.....
22	26,918	21,851	2	2	900	1,492	441	551
23	23,214	21,032	7	7	688	500	26,300	22,666
24	138,000	114,000	5	5	20,000	10,000	15,000	15,000
25	692,000	663,000	17	17	72,500	39,600	52,000	52,000
26	16,238	12,777	1	1	1,573	485	7,500	7,500
27	242,801	198,918	10	10	13,307	10,517	80,000	100,000
28	5,014	2,562	5	5	4,441	4,190	28,000	25,000
29	33,731	30,888	2	2	2,128	2,482	15,229	13,779
30	75,434	59,098	8	8	13,009	2,800	.....	.....

paper; lumber; packing houses. Several reported "all industries in our territory are sold."

Promising fields for utility power sales were given as follows: Metal heat treating; machinery; automobile, small manufacturers; air conditioning, refrigeration. It may be noted that, broadly speaking, the industries that lack economic knowledge are difficult to sell and those that have this knowledge are sold readily.

The outlook for industrial power sales reported is as follows: twenty said "good," fifteen said "fair" and six said "poor." Since these data were obtained before the present pick-up in business the consensus of opinion was sound.

The man-power to operate industrial power sales, the total expenses of the power sales departments, the amount of new business obtained and the industrial output of typical utilities are given in Table IV.

It will be noted that there is a wide variation in unit and total figures. This is natural because of the variation in local conditions. Unit derivations or general deductions are worthless from these data, but they should serve to guide and check operations in power sales.

The significant conclusions to be made are given in the following:

1. Private plant competition and installation did not increase in 1933 and 1934 and amounts to a small percentage in utility power sales.

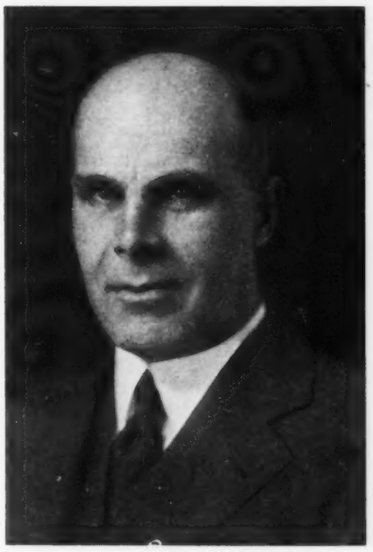
2. The growth of new industries and the existence of old industries will bring back a rapid increase in power sales as soon as general business conditions improve. This is now going on and recent data afford positive evidence that the industrial power load may exceed all-time values this winter.

3. More study can well be given to costs and returns in power sales and in method of selling to selected industries.

When Is a Holding Company Unnecessary?

WE HAVE only two companies in our entire system which are not absolutely necessary to the ownership and operation of the system and one of these is now in shape for liquidation. Both of them antedate in time by many years the formation of the top holding company itself, and still, by the provisions of this bill, my company would be forced to go out of business within a few years by divesting itself of control or ownership of its properties. Our income is limited entirely to return on securities owned, without any profits whatever from intermediary companies. We do not have special classes of voting common stock and our equity represents a very substantial investment of about 26 per cent of the total property value; our corporate organization is extremely simple, we furnish expert supervision at cost—which cost is about two-thirds of 1 per cent of the gross earnings—and have an excellent record for the extension of service, the improvement of its quality and reduction in rates, and yet in spite of all this, under the terms of this bill our company is marked out for destruction.

—Extract from an address to the Naval Academy Graduates Association by



C. W. KELLOGG,
Chairman Engineers Public Service Company.

Results With Quick Reclosure

Problems Involved With Applications to Different Conditions—Oscillographic Records of Performance and Results During the 1934 Lightning Season

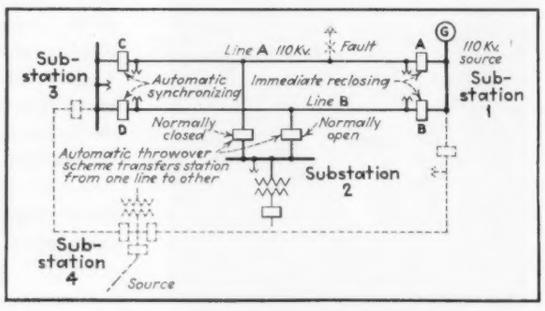
By J. T. JOHNSON, Jr., . . . J. W. GRAFF
Operating Engineering Department, Alabama Power Company

IMMEDIATE reclosure of 110-kv. breakers on the Alabama Power Company system has been found very satisfactory and highly advantageous on radial feeders and tie lines. On tie lines terminating at generating stations or synchronous-condenser substations, however, the problem continues to be an active topic for study. Experience with immediate reclosing of intermediate and low-voltage breakers that led to this practice was briefly related in a recent issue* where major attention was directed to the control problems with 110-kv. breakers and their solutions. In what follows will be presented the problems of application of immediate reclosure to such breakers when used on radial feeders, tie lines to automatic substations, double-circuit tie lines with intermediate load, tie lines terminating at generating stations or synchronous equipment, and experience with such practice in 1933 and 1934, including a summary of results during the 1934 lightning season:

Immediate Reclosing on Radial Feeders—The first applications of immediate reclosing to 110-kv. radial feeders maintained industrial and domestic lighting and heating service, and service to small motors. However, experience soon indicated that the inherently slow action of existing breakers in completing the full duty cycle (closed - to - open - to - closed position) prevented maintaining service to a majority of motors equipped with any form of undervoltage relay protection. In an effort to remedy this situation the COC operating cycle of each breaker was decreased as much as possible by a more careful mechanical adjustment of all moving parts and by the elimination of any unnecessary time in control relays.

Tie Lines to Automatic Substations—Conversion of certain centrally located primary substations to full automatic operation necessitates that important tie lines from reliable sources of power be immediately re-energized to permit synchronizing automatically and thus restore normal system connections in minimum time. Immediate reclosing is necessary to prevent automatic opening of some parallel circuit which becomes overloaded due to the tie line being out of service (see Fig. 1).

*ELECTRICAL WORLD, Aug. 31, 1935, page 21.



Dotted line represents a parallel circuit, which would be overloaded with tie lines out of service. Extreme speed of operation of breaker *A* or *B* is not essential, but prompt synchronizing or synchronism check across breakers *C* or *D* is imperative to prevent continued overloading of reserve source of power represented by dotted line. Immediate reclosing relays on breakers *A* and *B* are interlocked with line-potential devices or potential transformers to insure reclosure only on a de-energized line. Automatic synchronizing on breakers *C* and *D* to facilitate restoration of normal system connections.

Fig. 1—Immediate reclosing on double-circuit line with intermediate load

Double-Circuit Ties With Intermediate Load—Where an intermediate primary substation is normally fed from one circuit of a double-circuit line an automatic throw-over relay scheme will transfer the substation to the other line in case of failure of normal supply. For all temporary faults on the first line the substation suffers a complete interruption of 10 to 30 seconds, required to make the transfer. Application of immediate reclosing to the tie-line breakers at the supply end, as shown in Fig. 1, solves this problem by immediately restoring service to the intermediate substation.

Tie Lines Terminating in Synchronous Equipment—As previously stated, the problem of applying immediate reclosing to a long tie line terminating in either generating plants or synchronous-condenser substations has not been completely solved. The complications involved are due principally to the fact that either generators or condensers tend to prolong any arcing line fault during the time that the source breaker is open. Failure to clear the arc before immediate reclosure has resulted in reopening the source breaker with consequent total interruption to the line. The ideal solution lies in the development of relaying for reliably opening all sources of feed-back before attempting to reclose.

Where synchronous condensers are connected to the line experience and staged tests have shown that the condensers are able to prolong an arcing line fault for only a comparatively short time due to the reduction in speed and voltage of the condensers under short-circuit conditions. Fig. 4 is an oscillogram, showing a successful "immediate" reclosure on such line when a three-phase arcing fault was applied. Where distribution of short-

# of 110-Kv. Breakers

circuit current will permit, such relaying may be accomplished by means of the short-circuit kva. furnished the fault by the condenser. However, this method has not proved entirely reliable. In some cases the condenser is relayed by the overcurrent relays when the line is re-energized out of synchronism.

Station Tie Lines—When a line terminates at both generating plants and synchronous - condenser substations, such as the "Mobile line," the problem is further complicated by the necessity for relaying to rapidly separate generating plants before re-energizing the line, thus preventing the disturbances incidental to reclosing out of synchronism.

Immediate reclosing as now used on the Mobile line (Fig. 2) is the result of progressive steps of relay application, observation with automatic oscillograph equipment and other study covering a period of several years. When originally placed in service the line-source breaker had an initial reclosing cycle of 45 seconds, which was later reduced to 15 seconds for more rapid restoration of service. Prior to the 1932 lightning season an automatic six-element oscillograph was installed on the breaker to obtain data on the practicability of reducing the reclosing cycle sufficiently to maintain service on the entire line. As a result of the 1932 observations the reclosing cycle was reduced first to 10 seconds and then to 6 seconds. Further observations were made during 1933.

One of the first problems encountered on the faster reclosing cycle was

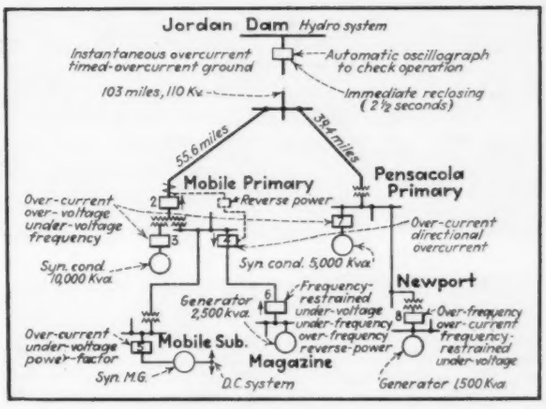


Fig. 2—Relaying and reclosing features on Mobile line

Before reducing the initial reclosing time of breaker No. 1 to 2½ seconds several changes were made: the frequency-restrained undervoltage relays on breakers 6 and 8 were speeded up; a set of reverse power relays connected to the current transformers in breaker No. 2 were arranged to trip breaker No. 4, providing back-up protection for separating Magazine, and a power-factor relay was provided to trip breaker No. 5, when the 110-kv. line was reclosed immediately out of synchronism with the synchronous motor-generator set.

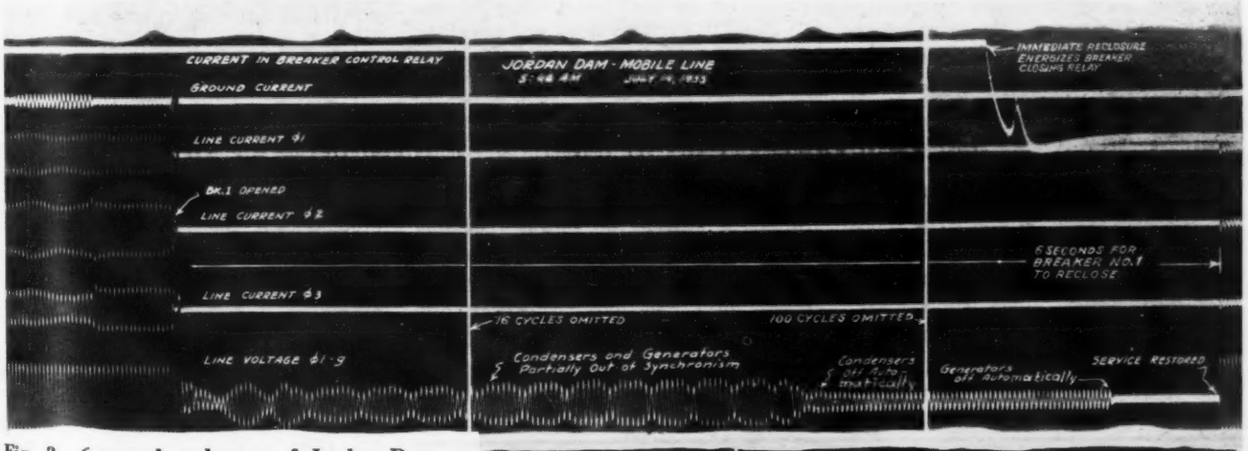


Fig. 3—6-second reclosure of Jordan Dam breaker

Refers to performance of breaker No. 1 (Fig. 2) prior to final modification. The reclosure was successful in so far as equipment operation was concerned, as shown by the fact that both generators and condensers were relayed before the line was re-energized. But reclosure was not rapid enough to maintain service on the line, indicating the desirability of further reducing the initial reclosing time of breaker No. 1. Such oscillograms indicate the necessity for more rapid relaying of generators before attempting a faster reclosing cycle on breaker No. 1.

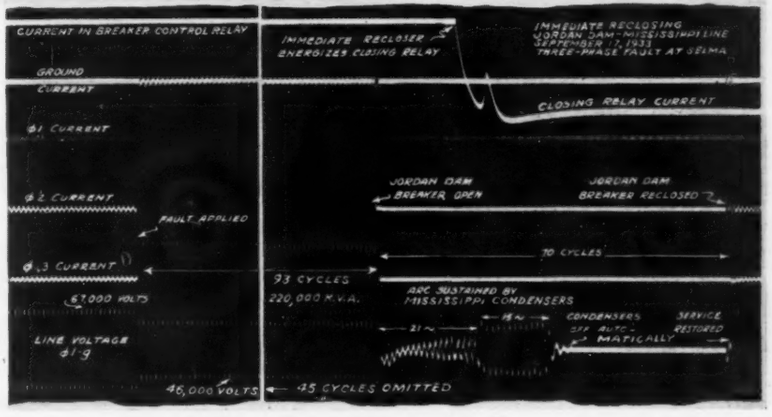
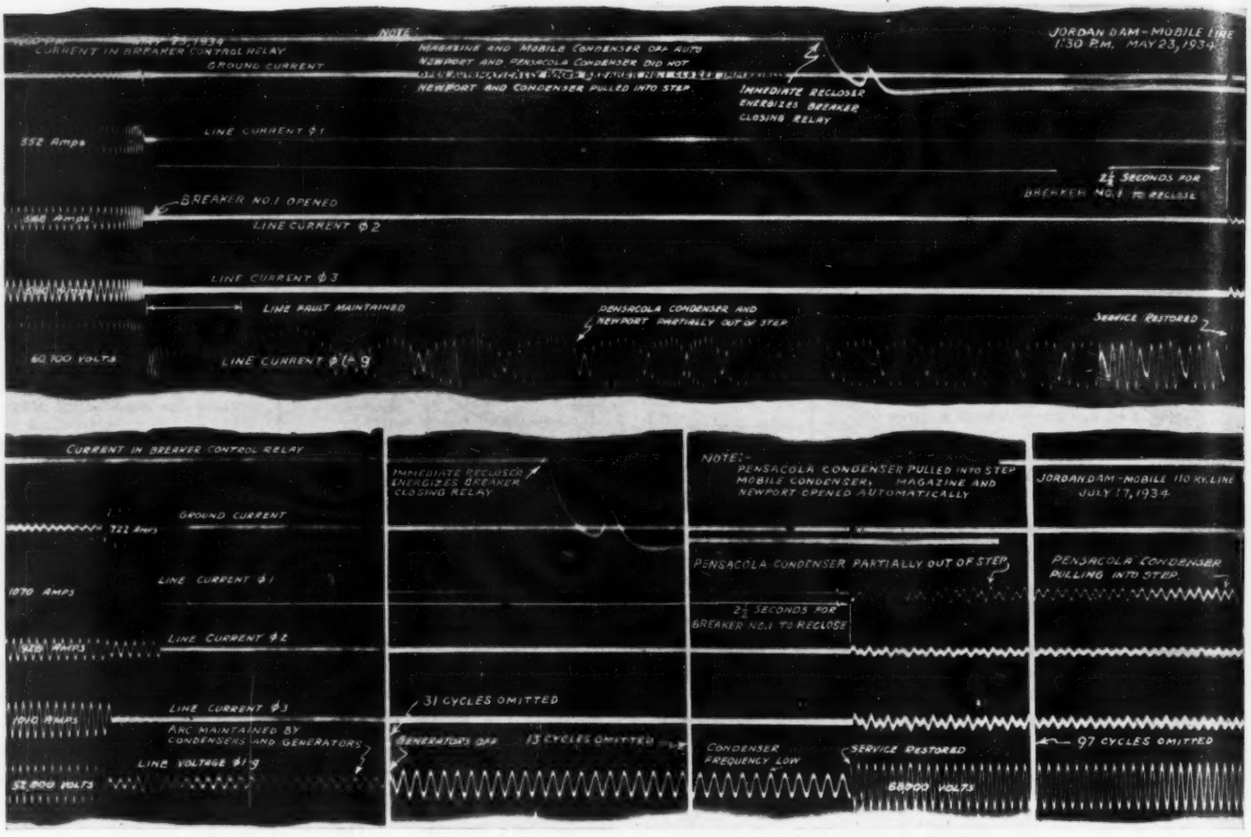


Fig. 4—Reclosure on line terminating at two synchronous-condenser substations

Followed application of three-phase arcing fault, which was prolonged only 21 cycles by synchronous condensers. After 15 additional cycles both condensers had relayed off the line.



Figs. 5 and 6—Reclosures on line feeding synchronous condenser substations

Refer to system conditions shown in Fig. 2 after the improvements noted had been made. The immediate reclosing cycle maintained service on the line, but the voltage disturbance resulted in loss of large motor load.

the necessity for rapidly relaying the source breakers at Magazine and Newport to assure separation of the generators before re-energizing the line and to prevent them prolonging any 110-kv. arcing line fault. (Previous oscillograms had already shown that the condensers at Mobile and Pensacola could not maintain a 110-kv. arc for any appreciable time.) Frequency-restrained undervoltage relays were provided for this service and have proved satisfactory except under light-load conditions, when an interruption on the 110-kv. line does not overload the generators sufficiently to cause a drop in frequency. A typical automatic oscillogram of a 6-second reclosure of the breaker at Jordan Dam is shown in Fig. 3.

During the early part of the 1934 lightning season the initial reclosing time of the Jordan Dam breaker was reduced from 6 seconds to its present setting of 2.5 seconds. However, previous to this change the modifications outlined under Fig. 2 were made. Typical oscillograms of successful immediate reclosures of the Jordan Dam breaker obtained after the changes mentioned above were made are shown in Figs. 5 and 6.

The entire problem continues to be an active subject for study. It is likely that before the advent of another lightning season service may be further improved by reducing the reclosing time of the Jordan Dam breaker to the minimum required for the breaker mechanism.

Conclusions — The accompanying tabulation shows the results of 110-kv. and 44-kv. recloser operations during the 1934 lightning season. Maintenance records of the Alabama Power Company show that no extraordinary maintenance of breakers or other equipment has resulted from immediate reclosure of 110-kv. breakers, nor has there been any indication of extreme stresses in any equipment. Experience shows that the principles of immediate reclosing are fundamentally sound and indications are that faster breakers will further increase the advantages to be derived from application of immediate reclosure of high-voltage breakers.

Results During 1934 Lightning Season

The difference in percentage of successful immediate reclosures of 110-kv. and 44-kv. breakers is due not only to the fewer number of 110-kv. immediate reclosures, but also to the fact that a large number of these operations occurred on a double-circuit steel tower line similar to that shown in Fig. 4. On such lines an arcing fault on one line is often communicated to the second line, with the result that the arc is maintained, thereby preventing a successful immediate reclosure.

	Number of Breaker Reclosures	Number of Times Breaker Remained Closed on Reclosure: First (Immediate)	Second	Third	Number of Lockouts	Number of Failures to Reclose
110-kv. breakers	78	50	17	4	6	1
Percentages	100	64.1	21.8	5.2	7.7	1.2
44-kv. breakers	751	538	122	14	70	7
Percentages	100	71.6	16.2	1.8	9.3	0.9

Iowa Active in Rural Electrification

Iowa State College Works With County Agents to Get Facts and Disseminate Information—Details of Bulletins Sent and Questions Asked the Farmers

OUT in Iowa, under the auspices of the Iowa State College extension service, active work is under way to co-operate with the R.E.A. in speeding up rural electrification. Essentially the method is to use the county agents to get in direct contact with farmers to find opinions and data. A series of bulletins and questionnaires have been prepared by Frank D. Paine, rural electrification engineer, Extension Service, Iowa State College, and issued to the county agents for their use.

The first bulletin explains the R.E.A., points out that all matters must be taken up with Mr. Cooke, explains that energy may be had from private or municipal plants and specifies what the application to Washington should contain. This includes:

1. Name of organization or proposed organization with names and addresses of official representatives.
2. Map showing location of proposed line and customers with statements of contributory information.
3. Copy of proposed contract for purchase of electricity at wholesale rate schedule.
4. Sample copy of proposed articles of incorporation.
5. Proposed schedule of rates and charges to customers.
6. Statement giving the principal facts regarding each farm and the important factors which apply to the operation of the farm. Ways electricity may be used, with estimates of kilowatt-hour consumption.
7. Preliminary specifications for line and equipment with an estimate of the cost of the line.
8. Statement of proposed business operations of the corporation, with estimates of expenditures for electricity, operating expenses, amortization of principal, interest, depreciation and maintenance and an estimate of retail revenue.

Another bulletin asks the agents to find out from the farmers certain facts that are outlined in a questionnaire. They are asked if they will take electric service and the amount they would pledge to pay each month. They are asked about wiring, private plants, the appliances and equipment they would plan to use. Especially interesting is the question on depreciation. The farmer is told that depreciation will amount to $1.50 to $2.50 per month per customer and he is asked to vote on one of the three proposals for handling this depreciation.*

These are:

1. Include the amount necessary to finance this replacement with the monthly bill for electricity.
2. Defer payments for the first two or three years to induce greater use of service and increase payments in later years, to $1.75 to $3.25 per month.
3. Give the federal government a first mortgage on the line and include nothing for depreciation. The results of this plan would probably be that sooner or later the government would own and operate the line is given as the opinion on this questionnaire.*

*On this point a later bulletin quotes from a letter of W. E. Herring signed "for the Administrator, Rural Electrification Administration." The letter says:

"As a matter of fact, it is quite likely that no depreciation fund will be set up, since all projects submitted to us must be amortized over a twenty-year period, including interest at 3 per cent. Hence, if a depreciation item was also carried, it is tantamount to a double charge to present customers. A maintenance fund will of course be created, and if this is properly handled no depreciation fund is necessary. As a matter of fact, the customers will have no say as to the plan we follow, so that it would seem your No. 4 bulletin will serve no useful purpose."

Another interesting bulletin gives an estimate of costs for rural line with costs based upon R.E.A. proposal and actual operating records from rural lines. The rate of 3 or 4 cents at the customer's meter means that the wholesale rate will be from 1½ to 2 cents, and Mr. Payne does not believe a lower rate than this can be had.

Another bulletin points out the work that the Extension Service is prepared to do in co-operation with the county agents and the farmers. This includes:

1. Application of Planning Board surveys and maps to counties or districts considering rural electrification.

[*Continued on page 69*]

Iowa Estimates of Rural Line Costs

Estimated cost per mile $1,080.00

This cost includes transmission line, transformers, lightning arresters, etc., but does not include the meter or the wiring in the farm buildings.

3 customers per mile, share per customer $360.00

Rate for electricity should include:

	Per Month
1. Payment on principal	$1.50
2. Interest (estimated)	0.50
3. Operating expenses	0.30
4. Insurance	0.15
5. Maintenance	0.60
6. Depreciation	1.50
Total per month	$4.55

NOTE:—If these lines are taxable, then taxes must be added to the above. The taxable valuation will be approximately $400 per mile.

If depreciation is not included this total will be $3.05 per month.

To these costs should be added the cost of current. This may vary from 3 to 4 cents per kilowatt-hour at the customer's meter. If the customer used 100 kw.-hr. in a month his total cost per month would be:

With depreciation	$7.55 to $8.55
Without depreciation	6.05 to 7.05

2½ customers per mile, share per customer $432.00

Rate for electricity should include:

	Per Month
1. Payment on principal	$1.80
2. Interest (estimated)	0.55
3. Operating expenses	0.35
4. Insurance	0.18
5. Maintenance	0.72
6. Depreciation	1.80
Total per month	$5.40

If depreciation is not included this total will be $3.60 per month. To these costs should be added the same cost of electricity given above. For 100 kw.-hr. per month the cost would be:

	Per Month
With depreciation	$8.40 to $9.40
Without depreciation	6.60 to 7.60

The Electrified Farmer in the

Our New National Issue—"Juice for Lamps of a Million More Farms"—Electrical Comforts for the Cows, Pigs, as an Aid to A.A.A.

By RAYMOND S. TOMPKINS

NOT infrequently these days it is the curious fate of the power and light industry to have the ball snatched right out of its hands by a government administration which is probably more alive and alert for opportunities to snatch the ball than any administration in the country's history. This is said in no disparaging spirit. The current administration is alert and alive for ball-snatching opportunities simply because it has to be. Not to mix the metaphors too much, it is also on the lookout for straws to grasp against drowning, and it is keeping its eyes open for any port in a storm.

If there is any institution in the country that seems to combine the best features of all three—a ball to snatch, a straw to grasp and a port to scurry into—it is the light and power industry. Its stability, its earning power, its own fool-proof setup for sound expansion, all tend to make a distraught New Dealer who is uncertain where his next billion is coming from water at the mouth.

The latest ball-snatching opportunity to be seized is the electrification of rural America. Many citizens were surprised and interested to learn recently that the hidden secret of recovery had been discovered at last. It was nothing more nor less than the electrification of the American farm, with parlor lamps in every pigpen and floodlights in every henroost.

THEY would have been still further surprised to learn that the whole business, somewhat modified so as to make sense, has been the dream and plan of the electrical industry for years. But they would not have got any such idea as that from Washington, D. C. Instead, they would have been constrained to suspect that the power people regarded the American farmer as an amiable lunkhead who hates electric lights because he can't blow them out when he goes to bed. They would have been likely to understand that rural electrification is something the power industry has always regarded with distaste; that it would have to be crammed down the industry's throat. In an outline of the rural electrification program the statement was made: "In the past the electric industry has skimmed the cream and left the milk. Today it must take the milk with the cream."

It was indicated that the industry's statisticians had vastly overestimated the cost of building rural lines; that it had not tried to build lines "tailored to the farmer's needs," but had wanted to make him pay for lines more expensively constructed than necessary. While all farmers yearned to milk cows and hatch chickens by electricity, and their wives and daughters clamored for electric kitchens, power and light companies made haughty snoots at them because they couldn't pay the bills for electric service, which included "Wall Street overheads, expensive rents, luxurious, ornate fixtures and high gross profit margins." That, at least, was the Washington picture.

PROMPTLY, therefore, the electrification of the American farm became a new "national issue." The pig-headed electrical industry was on one side and the high-minded administration on the other. Today it is still spoken of as a "national issue." The sum of $100,000,000 has been appropriated out of the work-relief billions to make every stable-yard blossom at night like Broadway. *Collier's*, the popular national weekly, sends John T. Flynn, an able staff writer, to Washington to look into this new "issue" and inspect this discovery of a new route to recovery. Mr. Flynn is astonished and delighted with what he hears, and exclaims: "Juice for the lamps of a million farms—to start with—and at the same stroke, jobs for city folks in thousands of factories!" Further along he ruminates wistfully, "Maybe we can get out of the doldrums by electricity."

Well, it makes even a calm and self-controlled family physician a little sore to have a patient suddenly start taking his prescription not because he told him to but because some witch-doctor recommended it. The fact is more and cheaper electricity for quicker national recovery has been the prescription of the power and light industry for several years. The present state of electrification of the American farm is actually the power man's pride. How, do you suppose, have farmers already learned that there is another way to milk a cow besides with the fingers; that with electricity you can clip a horse, irrigate a field, make oats sprout, dehyrdate prunes, introduce hens to daylight saving, get bigger and fatter apple pies from mother's kitchen and improve on a thousand and one more miracles of nature? Have they learned these things since rural electrification became "a national issue"? Were their teachers noble fellows from the Washington brain factories? Hardly! The fact is the farmer already knows a good deal about the blessings of electricity, because the power people have been teaching him for years. For years their scientists and inventors have been inventing new electrical farm appliances. For years they have been extending their lines into the rural districts. For years their salesmen have dogged his footsteps.

AT THIS moment not less than 1,100,000 American farms are either enjoying the blessings of electricity or can get them by the simple expedient of calling up the electric light company in the nearest town. Hence, when Mr. Flynn wrote, "Juice for the lamps of a million farms to start with," he could have written "of a mil-

New Deal Dell

lion *more* farms." The "start" has already been made and it is a pretty long start.

ELECTRICAL WORLD, in its "National Recovery Issue" of March 30, 1935, devoted several pages of text and pictures to an article entitled "Electrified Farms Offer a $484,700,000 Business." Was the magazine exploiting some brand new economic theory expounded by some college professor? It was not. It was reporting the latest figures in a practical business situation every power man has been studying for a long time.

The American farmer had not only heard of electricity but was using it long before he ever heard of the New Deal. As early as 1927 Minnesota and Michigan hog breeders were saving the lives of little pigs by putting electric heaters in their farrowing pens. Now, the New Deal calls, not for saving the lives of little pigs, but for destroying them in order to keep up the price of pork. Here the administration Messiahs of rural electricity will bump their foreheads against a pretty problem—which is the "more abundant life" for a farmer who raises pigs—to give him electricity and increase his pig families, as the Minnesota farmer and many others like him have done, or to keep him in ignorance of electric pig raising and let his pigs die? Some smart "abundant lifer" will probably combine both principles by teaching the farmer to execute his surplus pigs in an electric chair.

BEFORE me lies a large C.R.E.A. Bulletin, dated November, 1931. C.R.E.A. stands for Committee on the Relation of Electricity to Agriculture. This issue of November, 1931, is a revision of the material published in the C.R.E.A. Bulletin of January, 1928, and this latter bulletin was No. 1 of Vol. IV. So the Committee on the Relation of Electricity to Agriculture has been functioning for a good many years. What is this committee? It is a national group in which were represented (according to this 1931 bulletin) farmers, grangers, electrical equipment manufacturers, power and light men, women's club leaders, state project directors and representatives of the Departments of Agriculture, Commerce and Interior of the government of the United States.

Apparently this group's job was to find out what the American farmer could do with electricity and what electricity could do for him, and then to spread the information around as far as possible. The information in this bulletin of 1931 is astonishing to any one who has been led to believe that the idea of more bright lights on the farm originated in the cerebellum of a brain truster.

According to this surprising bulletin (a 332-page book, set in small type two columns wide, and full of pictures), electricity was already being used on American farms not only for milking cows, but for giving each cow a sanitary individual drinking cup, grooming her before milking to keep hair, dirt and scurf out of the milk, trapping and electrocuting the flies that bothered her, keeping her cool with electric fans, ventilating her barn in winter and summer, and even keeping her entertained by radio. For it appeared (page 178) that the farmers who operated "Marymoor Farm," near Kirkland, in the State of Washington, had installed a large radio in their cow stable. It stood in the aisle between the stalls, and the cows were all backed into the stalls so they could face outward and see where the music was coming from, and you would have thought from the proud and contented looks on their faces in the picture in this bulletin that they suspected the crooner then performing was a sister cow who had made good in the big city.

IT APPEARS, moreover, that in practically every case electricity on the farm promotes not the "economy of scarcity" sanctioned by the disciples of "the more abundant life," but the "economy of plenty," which is the hated fetish of those who believe in producing for profit. Not only were infant pigs being conserved by heated pigpens, but milk supplies were being increased by electric milkers, electric cow-fans and electric flytraps; electric lights were making hens lay more eggs; electric incubators were producing more chickens; electricity was refrigerating fruits and vegetables; cooking the insect pests from bulbs, irrigating unproductive lands; in short, increasing every conceivable product of the farm, from the wheat and corn which it saved by irrigation and insect control, to the butter and cheese it produced in the farmers' pantries. To say nothing, of course, of the increased production made possible in the farm kitchens, where the farmers' wives and daughters could turn out more and better pies in their electric ovens and the increased energy and health for everybody on the farm resulting from electrically improved opportunities for refreshing hot baths after hard days in the fields.

This tendency seems not to have declined as the years went on, but to have increased, until just before the dawn of the New Deal era it had reached its peak. It was estimated in 1932 that about 1,000,000 American farms were electrified. On all of them electricity was working away for dear life (on some more than on others, of course), making two quarts of milk, two eggs, two chickens, two bushels of wheat and two pigs grow where only one of each had grown before. How the new National Rural Electrification Administration is going to put a stop to this, while at the same time extending electricity even to sections where it costs $10 to send a farmer a postcard, is one of the jobs everybody will watch with great interest.

YET IT cannot be denied that farm electrification in this country did not proceed with the New Dealers' idea of speed. But it should be noted, in this connection, that standards of speed differ. Nobody seems to have expected that good roads should be built out to remote or isolated sections, nor that such public services as water or sewers should be extended faster than people could pay for them. It has been the feeling of the power people that, generally speaking, the extension of electricity into the country should be governed by the same sorts of economic considerations. Nevertheless, electricity has been nothing like as slow in going out to meet the farmer as his roads, his public water supply service and his sewer service. Unfettered by the sorts of political chains that hamper and hogtie the development of systems of roads, water supplies and sewer lines, the power and light business had actually been the spearhead of the advance of culture toward the remote farmlands.

Today, New Deal publicity bureaus to the contrary

notwithstanding, virtually any farmer in the United States can have electricity. He cannot, of course, get it for nothing. But the idea that he will have to pay outrageous and unfair rates for it is as unfounded as the idea that no distributing system makes it available to him. Transmission lines now extend from generating stations to substations in virtually every city, town and village of more than 1,000 population in the United States. From these stations rural lines reach the farms.

These rural lines serve about 2¼ million customers. Of course they are not all farmers. Nearly two-thirds of them live in the little villages that nestle in the green farm valleys. But how this rural and farm light and power business has grown! In 1923 only 177,000 farms were electrified in the United States. This was only 3 per cent of the total. By the end of 1933 more than 710,000 farms were electrified, an increase of more than 400 per cent in ten years. How was this accomplished? By grabbing the farmer by the scruff of the neck and cramming electric gadgets down his throat at prohibitive cost, whether or not he needed them and could pay for them? By ignoring him as a stupid fellow too steeped in cow-dung and misery to know an electric light bulb from a goose's egg? No, this increase of more than 400 per cent in rural electrification in the United States in ten years was accomplished by mutual recognition between the farmer and the electrical industry of the fact that electric service on the farm meant better business for the farmer and better business for the industry. It was accomplished by salesmanship and promotion.

TRUE, it might have gone faster. But several things stood in the way. One was the inability of a good many farmers to buy electrical farm apparatus. Nothing would have pleased the power people better than to see the prices of these things reduced. But manufacturers' records indicated that most of these electrical farm appliances were still in the experimental stage or had very recently got out of it, and the cost of producing them was but little less than the prices at which they sold them, so frequent and extensive were the changes that had to be made to improve reliability, adaptability and economy.

Indeed, in this connection it appeared that it was a fortunate thing for the farmer that he hadn't rushed more precipitately into electrification. Farmers who had invested heavily a decade ago in electric farm appliances would have had to junk them today in order to compete successfully with other farmers who had waited for later inventions and developments.

Another obstacle was the farmer's natural hesitation at spending money which was hard-earned enough and scarce enough, Heaven knows, on some new and untried electric miracle-worker that he knew nothing about. This tendency required a process of slow and gradual education, and it couldn't be rushed.

Still another difficulty was the high cost of building and maintaining lines along highways to farmers who could not pay rates that justified such costly investments or who were not sufficiently numerous to use enough current to get the rates down.

Slowly, however, all these difficulties were being met. The problems were as familiar to the power man as the sight of his own face in a shaving mirror in the morning. He recognized (as Morris Llewellyn Cooke, the new Rural Electrification Administrator, has since said he ought to do) the fact that this was a social problem as well as a financial problem, and while he felt no more in duty bound to make foolish and impracticable line extensions than Mr. Cooke's colleagues in government felt in duty bound to make foolish road, water or sewer extensions, nevertheless he was willing to shoulder his share of the social responsibility.

More than a year ago this threefold problem was recognized:

First—To determine areas where farm density was great enough to make new lines feasible even if not immediately profitable.

Second—To locate farmers able to finance wiring of buildings and purchase of appliances necessary for full home electrification.

Third—To develop sales plans to these farmers so that electricity could compete successfully for the farmer's dollar with telephones, automobiles, farm machinery and other commodities or services that the farmer needed or wanted.

EVEN so, the power and light people didn't expect to get all the farms in the country electrified, and, to be frank about it, neither do the New Dealers. The Census figures on farms include farms that have been abandoned, farms whose owners wouldn't take electricity if you gave it to them, farms occupied by tenants instead of owners, and so on. But the power industry, having gone as far as it could from every standpoint of sound business and economics, and even from a reasonable sociological standpoint, was ready to move forward at the first sign of economic recovery, into a possible market of nearly $1,500,000,000 of additional electrical equipment, estimated to require energy of the order of 4,000,000,000 kw.-hr. annually. At least 1,000 trained central-station rural electrification engineers were devoting virtually all their time to utility load building on existing local lines. The results were becoming evident when the national rural electrification program was announced.

This at once furnished the answers to all three of the problems above stated, for at one fell swoop it took the sum of $100,000,000 out of the works-relief fund of $4,880,000,000 and made it available to farmers, not as a business proposition, but virtually as the gift of the nation.

That the power and light industry should be grateful for this impetus to the rural electrification problem with which it has been struggling for so long goes without saying. That it actually is grateful is equally true. That the farmer should be grateful for one more set of bootstraps to pull himself up with is likewise obvious. That in the launching of this new experiment in federal bureaucracy and government-controlled sociology the power and light industry should come in for a few verbal kicks in the pants is probably to be taken for granted. It must, as has been so sapiently said, learn to take the milk with the cream. If this particular New Deal means better power and light business and wealthier farmers, then the New Dealers can snatch the rural electrification ball and welcome.

But the industry begs leave to raise a gentle protest at the implications that it has been so stupid about its own business as to pay little or no attention to the farm market for electricity, or even that it has been so stupid as to try to exploit the farmer or "goldbrick" him with unfair rates, excessive charges and insuperable conditions. When you know the facts the probable truth seems to be that, having no $100,000,000 of taxpayers' money to experiment with, it has, up to now, done about the best it could.

June Revenue Matches 1929

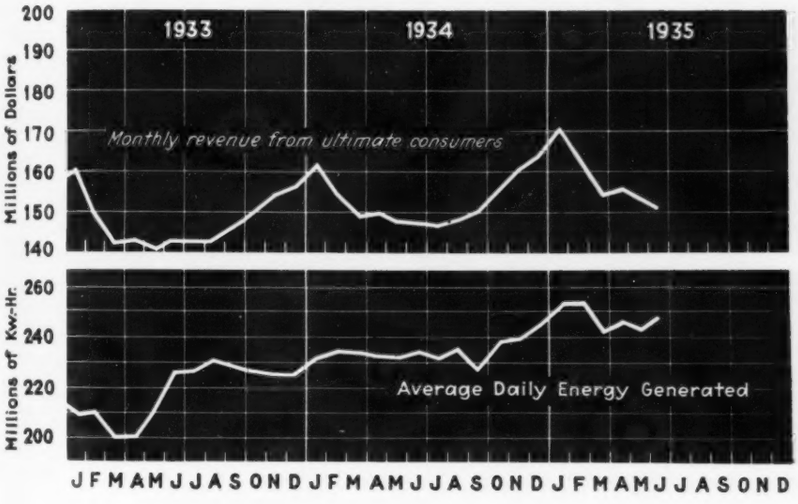
Utility gains over 1934 continue. Revenue rose 2.6 per cent and output 5.5 per cent above last year.

REVENUES for electric light and power operations came closer to the 1929 magnitude in June than in any preceding month this year. The total for the entire country was $151,436,900, according to the Edison Electric Institute, and was substantially on a par with the amount in June, 1929, but it was smaller than in the same months of 1930 and 1931. There was a decrease from May, as usual, but an increase of 2.6 per cent compared with June, 1934. The six months total of $949,164,000 shows a gain of 4.1 per cent over 1934 and 8 per cent over 1933, but fell short of 1930 and 1931.

Energy output for the month was 7,416,000,000 kw.-hr., or 5.6 per cent more than last year and slightly more than in 1929, thus establishing a new record for June. The average daily output increased, compared with May, approaching that of the winter months. Production from water power, according to the U. S. Geological Survey, constituted 43.7 per cent of the total. More favorable stream flow made possible a 27 per cent increase over last year, so that production from fuels decreased 7.2 per cent.

Sales to ultimate consumers, after allowing for energy from other sources and for transmission and distribution losses, totaled 6,147,370,000 kw.-hr., a gain of 4.5 per cent over last year.

All classes of consumers except street railways and a small miscellaneous group continue to use more energy than in 1934. The comparisons are shown in Table III. Domestic consumption increased nearly 9 per cent, bringing the total rise over June, 1929, to 54 per cent. Wholesale consumption came within 11 per cent of the June record (1929) and the lower levels of intervening years have been successively surmounted with the exception of 1930.



444,000 new customers

The number of customers rose during the month to 25,000,068, an increase of nearly 38,800, compared with May, and about 444,000 over June, 1934. Of the total, 20,677,152 were in the domestic group.

The average annual sales per domestic customer increased further to 648 kw.-hr. from 614 a year ago, and the average rate dropped to 5.20 cents per kw.-hr., from 5.39 cents. The corresponding monthly revenue rose 1.8 per cent to $2.81.

Table I—Monthly Revenue from Ultimate Consumers and Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1935	Revenue from Ultimate Consumers†		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent. Inc.
June	151,436	+2.8	7,416	+5.6	3,242	+26.9	4,174	—7.2
May	153,203	+3.6	7,556	+5.1	3,511	+17.3	4,045	—3.8
April	156,069	+4.1	7,368	+5.3	3,423	+ 4.2	3,945	+6.7
March	155,884	+4.1	7,553	+4.0	3,397	+15.8	4,156	—4.1

Table II—Regional Revenue and Energy Output in June, 1935

Compared with Corresponding Month of Previous Year

Geographical Region	Revenue from Ult. Consumers†		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
United States	151,437	+ 2.8	7,416	+ 5.6	3,242	+26.9	4,174	— 7.2
New England	12,807	+ 2.0	495	+ 8.6	271	+32.3	224	—10.7
Middle Atlantic	43,773	+ 1.5	1,829	+ 4.2	550	+16.7	1,279	— 0.2
East No. Central	34,528	+ 4.0	1,675	— 0.9	203	+63.7	1,472	— 5.8
West No. Central	12,668	+ 0.1	539	+18.3	217	+174.0	322	—14.2
South Atlantic	18,791	+ 4.4	816	+ 0.0	455	+ 5.3	361	— 6.0
East So. Central			353	+27.9	309	+49.1	44	—20.5
West So. Central	8,270	— 0.4	380	— 1.8	30	+513.0	350	— 8.5
Mountain	4,752	+12.5	281	+34.3	235	+41.2	46	— 8.0
Pacific	15,848	+ 3.7	1,048	+ 7.8	972	+17.8	76	—50.9

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central station.
†Preliminary.

Table III—Allocation of Energy June, 1935

Compared with Corresponding Month of Previous Year

Class of Service	Millions of Kw.-Hr	Per Cent Inc.
Total for distribution*	7,404	+ 4.9
Lost in transmission, etc.	1,257	+ 7.1
Sold to ultimate consumers	6,147	+ 4.5
Domestic	1,059	+ 8.9
Com'l, small light and power	1,095	+ 4.3
Com'l, large light and power	3,396	+ 3.7
Municipal street lighting	152	+ 6.0
Railways—street, interurban	331	— 1.9
Railroads—electrified steam	65	+18.6
Municipal and miscellaneous	49	— 3.1

*Generated, purchased from other sources, imported, less energy used in railway and other departments.

One of a Series of Intimate Talks with Industry Executives

Hoover on Specialty Selling

An Interview by EARL WHITEHORNE

WE ARE coming into another great home-building cycle in America. Thirty years ago —or about—the idea of making small houses beautiful swept like a wave across the country. Under the leadership of Edward Bok there was a renaissance in cottage architecture. Instead of just building square boxes, people began to put individuality into house plans. It altered the whole atmosphere of our suburban residence streets. And now another change is coming.

The present shortage of small dwelling houses is acute. The need is for low-price structures, with ultra-modern appeal and a new technique is evolving, first made visible at the Century of Progress. Prefabricated houses of new materials are coming, but primarily small homes built around ingenious equipment for comfort and economy. In this development electrical appliances will feature large and the electrical industry must play a major part.

I talked about it the other day with H. W. Hoover, president of the Hoover Company. I was interested in his opinion, because this fascinating idea of building a little trick house around a plant for labor, time and money saving is, after all, a job of selling appliances. And the power companies and the dealers will still be selling separate appliances, to make up these complete installations. The problem, therefore, will be to coordinate the skillful selling of this whole variety of specialties. And I know of no company that over a long period, good times and bad, has done a more effective large-scale job of merchandising an electrical specialty. I asked Mr. Hoover how this selling job will have to be done.

"The American home today needs everything," he said. "Its equipment is all run down, worn out, and it needs new appliances just as much as the power industry needs domestic load and the dealer needs more business. And these homes will buy the appliances that are intelligently presented to them.

"But despite the fact that the idea of complete electrical equipment is gaining steadily in popularity and will be incorporated to a large extent in the new small homes movement, the problem is still one of highly organized marketing of individual products. Several million small dwellings of the new types will probably be built in the next few years. But there remain some 20,000,000 other houses, already connected to power lines, which are not yet properly equipped. Half of them have no vacuum cleaners, for example, to cite the appliance that I know the most about.

Organized marketing on a larger scale necessary

"In all these years the combined efforts of all the cleaner manufacturers, aided by their distributors, electrical dealers, department and housefurnishing stores and the utilities —with an army of salesmen calling on the home—have only succeeded in converting 10,000,000 homes to cleaning the electric way. There are 10,000,000 more homes to sell and probably 1,000,000 cleaners should be replaced each year. At least 2,000,000 need replacement right now. And the same general situation holds true of clothes washers and other appliances —the figures varying with their present saturation.

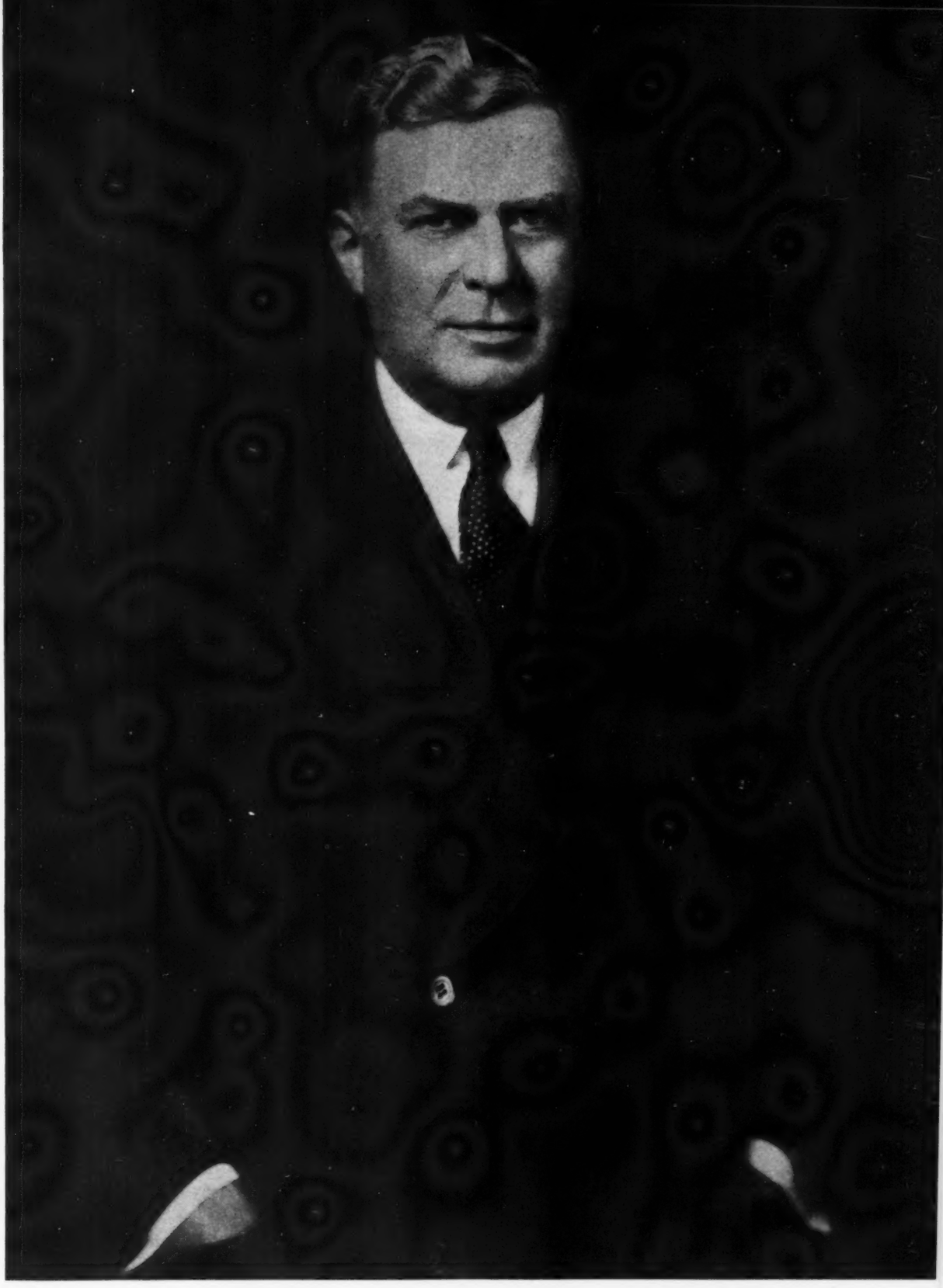
"The point I am making is that the present program of the electrical industry—reacting to reduced rates and increased selling by the utility companies—will call for organized marketing to the home on a scale we have never seen before. For the building of the great domestic load, which the utilities must now have, will entail more than the installation of ranges, water heaters and refrigerators, the heavy demand devices. It will compel the intelligent balancing of electric service to the needs of each household.

"Power companies have always been inclined to sell in short, high-pressure campaigns one appliance after the other. But to do the job that lies before them today, it seems to me, calls for a broader program that coordinates the selling of all appliances that the home needs. I know of only one way that this can be done. That is by separately creating demand for each worth-while appliance through adequate promotion and trained staffs. And the decision should be made not alone on the basis of load value per device. Its value to the household is the vital point, and sold in great numbers merchandising profit accrues and any load makes itself important."

"Do you mean that a utility company should set up separate manpower to market each kind of appliance?" I asked.

"It really amounts to that," Mr. Hoover said, "though naturally some devices move together—washers and ironers, for instance. But none move today without selling, and no worthwhile results can be expected without the long-time follow through of a consistent policy of creative marketing, a steady building up of public interest and demand. It calls for highly organized sales control, courageous appropriations and keeping everlastingly at it. But it is the only way, if all this equipment is to become standard in the American home within this generation.

"Frankly, I think we are going to see the power companies steadily more active in selling all types of appliances in the next few years. And if they work in constructive co-operation with the local dealers, the public and the entire trade should benefit."



H. W. HOOVER, president of the Hoover Company, a pioneer vacuum cleaner manufacturer who has made a major contribution toward electrifying the American home by a consistent policy of year in and year out vigorous selling.

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The Public Pays

ANYTHING that increases the cost of power company operation is a brake upon the progress of rates into lower and lower brackets. Some day in the not distant future the American people are likely to wake up to the fact that hostile policies and restrictive legislation on the part of the federal government toward utilities are costing the consumer dearly. Instead of hastening the era of cheaper electricity throughout the nation, New Deal laws are retarding rate reductions, if not actually threatening higher prices for service.

The cost of defending the industry against destructive legislation runs into substantial sums in direct monetary outlay. Beyond this, the diversion of time and effort of industry leadership from constructive work in utility development and business building represents a serious loss to the country. All through the years consumed in the investigation by the Federal Trade Commission of utility management, and especially during the recent sessions of Congress and numerous state legislatures, executives and staff members have been obliged to devote a tremendous amount of their energies to fighting political attacks on their enterprises. A major result of this life-and-death struggle has been the slowing down of modernization projects which would have contributed to cut costs, lower rates still further and furnish employment to many thousands of people in the heavy industries.

The dramatic cessation of interstate power transmission in Connecticut following the passage of the holding company law shows how far-reaching adverse legislation may prove to be. Samuel Ferguson's statement that the Connecticut Valley Power Exchange saved consumers several million dollars in operating company rate reductions in the past decade has thrown new light on federal control to the man in the street. The curtailing of these benefits to customers and investors helps nobody for the moment, but by focussing popular attention on losses resulting from bad laws, good may come. If the downward trend in rates is stopped or slackened by such legislation and by threatened further attacks on the industry, the public should know where to place the responsibility.

Every utility man knows that if co-operation on the part of the government should take the place of competition and animus toward power utilities, progress toward lower rates and improved service would be inevitable, even in the face of unprecedented tax burdens. If the people once realized that the public pays and pays for Washington's unsound and extravagant utility policies, a day of reckoning will come for politicians who have been playing with dynamite in their assaults upon a great and useful industry.

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Unsaturated Rural Service

FROM a comprehensive and well-handled survey of rural line extension possibilities in Massachusetts recently made public by the F.E.R.A. it appears that only 1 per cent of the state's population is beyond reach of existing circuits. There is a present opportunity to build 1,168 miles of new distribution lines to serve 5,474 prospective customers at an outlay of about $3,000,000, including wiring and appliances, to yield an initial increase in revenue of $215,847 per year. The logic of the report is clearly in favor of providing extensions to present power systems, no case being made out for government operation or line integration except where piecemeal additions to municipal systems are in order. As a load-building job, farm service extension in the Bay State is primarily a matter of advancing the electrical front by an average of 2.4 miles per line along about 500-odd salients, utilizing the co-operation of utilities, manufacturers, farm, educational and governmental organizations to bring the benefits of electricity to the individual farmstead.

Perhaps the most striking point developed by Director J. W. Young and his staff is the unsaturated condition of the rural service market even in so densely populated a commonwealth as Massachusetts. The existing farms consumed about 800 kw.-hr. each in 1934, compared with a 3,600 kw.-hr. standard for liberal usage. In the unserved rural areas, inquiry by contact showed that only 1.8 per cent of the prospects would purchase an electric range in the first year of service and but 0.7 per cent a water heater. About one-quarter would install electric refrigeration. About 84 per cent of the prospects were "radio conscious" and roughly one-third of those seen by the field forces would buy house pumps and the same proportion washing machines. There is a vast opportunity for sales effort in connection both with the heavier domestic appliances and the adaptation of electricity to farm processes.

When one considers the still limited use of electricity on farms already connected to power lines, the splendid potential market for both equipment and service is seen merely to await energetic cultivation. If this is so apparent in the most populous state in New England, crisscrossed by an admirable network of

transmission and distribution circuits, what cannot be undertaken in this attractive field in many other jurisdictions! Opportunities for financing rural extensions are now unusual; public relations are highly responsive to sincere efforts to enlarge the use of farm power, and in this sphere the co-operation of the government promises constructive results in many a locality. The time is ripe for vigorous action by all concerned branches of the electrical industry.

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Watch Corrosion of Fireproofed Cables

TROUBLE often arises in unforeseen cases and may do serious damage before detected if in unseen places. Specifically, one Eastern company has been experiencing increasing difficulty with corrosion in connection with the fireproofing of underground cables. In inspecting some 500 manholes about two-thirds were found to need no cable repairs, 27.7 could have repairs deferred, but 8 per cent demanded immediate attention. The older fireproofing jobs are not causing as much corrosion as the newer ones, practically no trouble being experienced prior to 1927.

Quite naturally the corrosion is most severe near the copper bonding strap. Trial is being given to the extrusion of a lead sheath over the bonding strap to reduce the accelerating effect of galvanic action on the alkaline corrosion. Some of the evidence points to the fact that the corrosion is associated with an increased amount of free alkali in the cement. At least tests made by several companies a few years ago revealed this rising tendency.

Those who have been aware of this hazard to cable sheath life have tried various preventives. One way is to wrap the lead with paraffined cheesecloth before applying the fireproofing, but tests indicate that there is some doubt of its efficacy. Using an asphalt compound is said to be better, but it is expensive and makes removal of the fireproofing difficult.

If as much as a third of the cables in manholes on all underground systems need inspection and overhauling the situation indicated is serious enough to warrant study of causes, effects and correction.

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Educational Highway Lighting

STATE highway departments are organized to build and maintain highways. They have not been concerned with lighting. But the motor vehicle departments are focussed on the safety problem. They study traffic, and by police work, warning signs and the correction of danger spots are fighting a persistent battle against the appalling toll in life and property that modern motor traffic is exacting. They are becoming increasingly interested in the possibilities for reducing night fatalities by adequate lighting.

Out of the interest is evolving the idea of educational highways—heavy traffic routes to be equipped with modern lighting and a system of educational roadside signs, with sufficient mileage to make a thorough impression upon any one who travels the road by day or night. For it is necessary in the demonstration period not only to present the lighting itself but to explain its value and importance in quick eyefulls of information that every passerby will automatically absorb, without conscious effort or having his attention diverted from the road ahead. It is a natural outgrowth of the various short demonstration sections that have been installed about the country—mostly with sodium-vapor units. It offers a direct attack upon the mounting menace of automobile accidents, which the state officials are studying with growing alarm.

Because the motor vehicle departments have money to spend for safety, they probably offer the most practical and promising approach to highway lighting—at least through the educational phase. Because the highways run through so many towns and counties and often across the territory of several power companies, leadership is difficult and finance hard to find on such a project. But a close contact with these state authorities by every utility, and a ready co-operation, will certainly carry the idea forward to the benefit of every user of the road. And out of it will ultimately come a large new market for power.

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Oil—The Great Unknown

INSULATING OIL plays a vital part in the electrical industry. From generator cable to step-up transformer, through oil breakers and high-tension cable back to step-down transformer and low-tension cable, oil is indispensable. In pothead, cable joint, bushing and coupling capacitor oil is relied upon for performance. Oil is the universal liquid insulator and medium for heat transfer. In these applications oil is subject to chemical reactions from its contacts with metal, acid and gases and in others it is subject to breakdown from heat and the action of electrical stress. It is used in conjunction with all materials and undergoes exposures and stresses of magnitude and complexity.

Naturally the complete characteristics of this material, used so freely and under such critical conditions, should be known. The chemical, the physical characteristics of the oil and a complete understanding of its reactions when used in conjunction with other materials are essential to progress. Yet today, despite an enormous amount of research, oil remains the great unknown.

Are dielectric strength, acidity and power factor true criteria of quality, and if so within what limits? What really happens to make oil good or bad or to behave properly when used in conjunction with other materials under heat and electric stress? What is the

life of oil and what determines it? These are a few of the questions that engineers would like to have answered. But the answers are not available today. Progress in research has been slow and most of the knowledge available came from empirical experiments.

Whatever the cause for the ignorance that exists, there is every incentive for starting augmented and more fundamental researches on oil at this time. The laboratories and the research talent are available. The need for the knowledge is paramount. Oil companies, equipment manufacturers and users of electrical equipment all need the knowledge. All should support a well-planned research program on oil of major magnitude. Oil—the great unknown—is a challenge to the competency of the electrical industry.

· TRENDS ·

THE EDITORS USE A SPOTLIGHT ON CURRENT HAPPENINGS

Buy More Power Bonds

LIFE insurance companies, with $22,000,000,000 of savings to keep invested, in the last seven months have purchased $1,721,000,000 worth of securities. Of this 48.5 per cent went into government obligations and 16.7 per cent into public utilities. Utilities were second choice. With roughly double the total purchases, they bought four times as many utility bonds as last year in the same period. Power companies bulk large in their selection. And whose opinion is more experienced?

Staggering Along on Capacity

ENGINEERING departments are getting busy. Old blue prints are being dusted off and new ones are being made. In several instances generating capacity is staggering along on the upper limits of load and new station capacity must be added. It takes two years to design and build a new station now, and those without foresight will be caught. That is why many power engineers are hard at work these days.

Perfection in Municipal Ownership

HERE comes a story of the investigation into the affairs of the St. John Civic Power Commission. Each member of the commission has been receiving free service for his home and place of business since the initiation of municipal ownership, twelve years ago. This despite the illegality and orders from the City Council six years ago that this practice cease. Also, the commission had been giving away ranges and heaters or selling them at half their cost to a number of customers. And again members of the commission had been profiting by doing contracting work and selling supplies to the civic power body despite iron-clad rules to the contrary. To cap the climax, not only did the commission members get free service for themselves but also they gave free service to local politicians. Judge J. A. Barry stated that it was evident that a few persons were getting light, power and appliances free, while regular customers paid for their own service and the free list also. We quote this case just to show that human failings are not peculiar to private ownership. In fact, the pressure for exclusive favors from local politicians and influential citizens is just a little harder on those who are politically appointed and freedom from regulation is conducive to dishonesty. Just why does municipal ownership avoid any abuses that may exist under private ownership? It has not in New Brunswick.

Future of Utilities

MUCH speculation prevails as to the effect of the holding company bill. Registration must occur with S.E.C. by October 1, but forms have not been sent out and it is expected that the first registrations will be in preliminary form. On the stock market a favorite indoor sport is to try to find the equity value of holding securities in terms of operating subsidiary securities, but here again it is difficult to arrive at correct conclusions. Lawyers and executives of individual utilities are still engaged in studying the provisions of the bill and are silent until these studies are completed. Executives of the E.E.I. meet this week to discuss policy with respect to the bill and may or may not make a public statement. Utility executives and the S.E.C. are following a wise policy. Until they find out just what the bill means and how it will be applied there is no reason for discussing its effects in the public forum in speculative terms.

These F.H.A. Appliance Loans

FINANCE companies don't like F.H.A. loaning on domestic appliances — refrigerators, ranges, clothes washers—with nothing down, five years to pay, lax credit restrictions and a 5 per cent discount per $100 of face value—which equals 9.7 per cent over the term. They have built up this business to enormous proportions and sold the public on substantial down payments, two or three years' time, prompt repossession for default and rates that net from 11 to 17 per cent on money actually owed. They see their market soon demoralized. Utility companies will welcome the cheap money, but should keep credit standards sane or they will be putting salt on the tail of a prospective disappointment.

New Deals, Domestic and British

WHILE recovery in the United States is being hampered by attacks on business in general and on the electrical industry in particular, other countries have been forging ahead. In Canada the official index of the physical volume of business in May reached a new high. Production is half as large again as it was in 1933. In Great Britain, we read in *Industrial Britain*, employment has risen to the highest total in fourteen years. Unemployment is at its lowest total for nearly five years, the number of persons registered having fallen on June 24 to 2,000,110, against 2,092,586 on June 25, 1934. Since the number of unemployed in the United States is approximately 10,000,000, according to the estimate for July by the National Industrial Conference Board, it appears that with less than three times the population of Great Britain we have five times the unemployment. We also have a New Deal.

NEWS OF THE INDUSTRY

E.E.I. Decides on Court Action

Eminent lawyers retained to test constitutionality of federal statutes — Holding company bill, municipal loans and T.V.A. the issues

Following the meeting of the board of trustees of the Edison Electric Institute held on Thursday, Thomas N. McCarter, president, issued the following statement: "In addition to the imposition of largely increased and discriminatory taxation, recent federal legislation has attacked the electric industry in three different ways, as follows: (1) the public utility act of 1935 . . . (2) that portion of the National Recovery Act which purports to give the government the right, by gift or loan, to aid municipalities in erecting power plants to compete with existing facilities . . . (3) the Tennessee Valley Authority legislation, which seeks to put the government directly in the power business, involving the destruction of existing facilities.

"In the opinion of eminent counsel, the greater part of this legislation is unconstitutional. The power program of the federal government involves the expenditures of billions of dollars which, in the main, is to harass and destroy private operation in the electric light and power industry in the United States, despite the fact that the people of this country enjoy the most efficient and widespread electric service, at reasonable rates, of any people in any country. . . .

"The board of trustees of the Edison Electric Institute has determined that the question of the constitutionality of these statutes should be presented to the courts at the earliest opportunity, in order that the rights of all may be judicially determined in accordance with the law of the land. To that end it has retained the services of the Hon. John W. Davis of New York to participate in the conduct of the case or cases which will contest the validity and constitutionality of the Public Utility Act of 1935. It has retained the services of the Hon. Newton D. Baker of Cleveland, Ohio, to participate in the conduct of the case or cases which will contest the validity and constitutionality of the gift and loan of federal money to induce or enable municipalities to compete with private companies now rendering efficient service throughout the United States. It has retained the services of Mr. Forney Johnston of Birmingham, Ala., and the Hon. James M. Beck of Washington, D. C., to argue before the Supreme Court of the United States in the case now pending, the constitutionality of the acts under which the Tennessee Valley Authority is spending huge sums of the taxpayers' money in its effort to further the doctrine of the abolition of private business for profit.

"The electric industry, to the extent that it is represented by the Edison Electric Institute, is of the opinion that it is its duty, in fairness to all, to assert and maintain its legal rights to continue to live and serve the people of the nation, subject to reasonable regulation by proper governmental authority, but that it will not and cannot acquiesce in having its properties confiscated merely to advance a theory of state socialism, already proven inimical to the rights of the American people."

Federal Power Commission to establish five regional districts

To facilitate co-operation between the Federal Power Commission and state commissions in the administration of the utilities law, the commission will establish five regional districts throughout the United States.

Industry Confers on Rural Power Plan

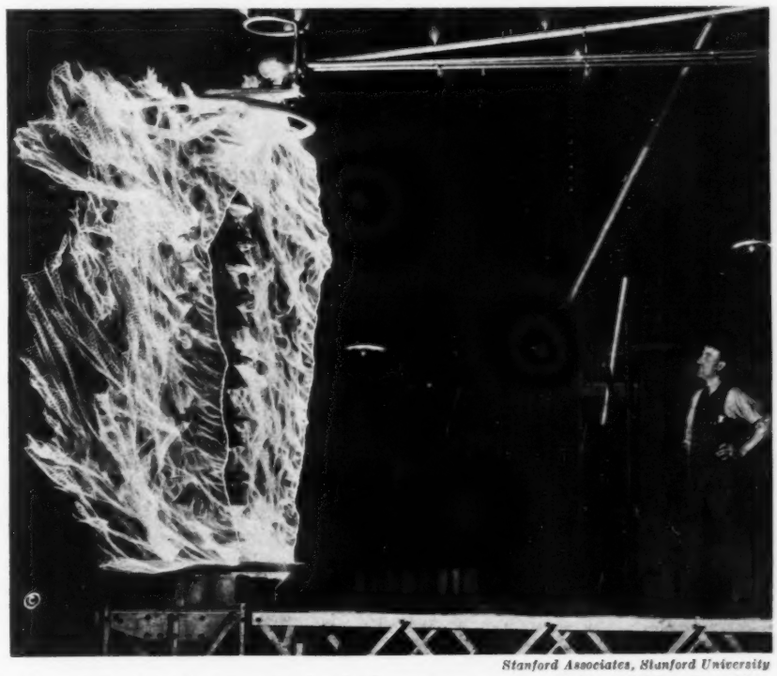
E.H.F.A. seeks views of electrical manufacturers at conference — Central Hudson utility commended for private financing of new lines

Plans for the merchandising and financing of electrical equipment and appliances in cities and rural areas throughout the country were canvassed last week at a hearing before the trustees and officers of the Electric Home and Farm Authority. Views of the electrical manufacturing industry were expressed by a subcommittee of the National Electrical Manufacturers Association rural electrification committee.

Under discussion were the terms upon which electrical equipment and appliances shall be sold, the maturity of the loans to be made by the authority, the amount of the loans, and merchandising methods. There was also discussion of plans to extend the line of appliances and equipment which is eligible for financing by the authority.

The views of the representatives of the industry were taken under advisement by

TESTING BOULDER DAM SWITCHES



Stanford Associates, Stanford University

This composite photograph of a flashover test on one of the 287-kv. Boulder Dam disconnecting switches shows the lace-like pattern of an 830-kv. sustained arcover made in the Ryan high-voltage laboratory of Stanford.

the board, which expects to formulate in the near future its detailed plans of operation.

Members of the subcommittee present were G. M. Haskell, chairman of the National Electrical Manufacturers Association rural electrification committee; A. B. Byler of the General Electric Appliance Company, G. T. Dunklin of the Westinghouse Electric & Manufacturing Company and H. J. Walker of the Frigidaire division of General Motors.

R.E.A. commends utility

Central Hudson Gas & Electric Company has won the applause of the Rural Electrification Administration. After having asked for a federal loan to build 500 miles of rural lines, the utility withdrew its application and will finance the work itself with part of the proceeds of a pending $1,000,000 30-year 3½ per cent bond issue. It made the application to feel out the federal plan. It found that it would be more advantageous to finance itself for the longer term than to take the federal loan for twenty years at 3 per cent subject to the accompanying conditions.

This is true largely because most of these extensions will be runs of a mile or so in length to pick up an unserved farm or an isolated rural home. There will be no 5- or 10-mile stretches. The building of this additional 500 miles of line extensions in the Central Hudson territory will practically complete the job in the Hudson Valley territory, centering on the cities of Newburgh, Poughkeepsie and Kingston. The remaining area is in country, where there is practically no market for electric service.

In acknowledging the withdrawal of the application, Morris L. Cooke, R.E.A. administrator, congratulated the company on its ability to procure private funds on such advantageous terms, and upon the fact that the proposed construction will provide service to 88 per cent of the farms within the company's territory as compared with the national average of 11 per cent farm electrification. Mr. Cooke also gave assurance that subject to conditions now being formulated, the company's plan for expansion in rural territory will be supported by government assistance through E.H.F.A. in the financing of individual wiring costs and the purchase of electrical and sanitary appliances.

Pennsylvania Utilities Active

Sales programs dominate situation — Destructive trends in national policies condemned — Rural electrification advancing rapidly — Althouse elected president

An attendance of 800 and an unusually good program characterized the meeting of the Pennsylvania Electric Association at Bedford Springs September 4-6. The program was divided broadly into two parts, one treating of the internal problems of the utilities and the other of broader discussions of national affairs as affecting utility operations.

President E. W. Judy opened the meeting with a review of the work of the association and its committees during the year. In sales, surveys and analyses were made of the several markets to find the sales resistances and the best methods to break them down. Also, there was an active development of sales programs to farms. Accounting men are working cooperatively to meet the problems introduced by new regulations. Operating problems are being solved on a co-operative basis and unusual success was had with safety programs. Mr. Judy said that new and heavy burdens had been placed on the industry, but that he had faith in the ability and courage of the people of the industry to overcome the difficulties. He urged that younger members have confidence in the future and act on broader national problems as well as on the local utility problems.

A method to personalize the utility to its customers was presented by Norman G. Reinicker. In suburban and rural areas a plan has been placed in operation on the Pennsylvania Power & Light System that functions to reduce the contact between customers and the company to one man who performs all functions. This district representative is assigned to 700 to 900 customers to deal with them on a personal basis—meter reading, collections, servicing, sales—all aspects of operations are concentrated in this man. Mr. Reinicker said that the plan was working well and that little difficulty had been had in finding and training district representatives.

Liversidge decries forces of destruction

Despite the fact that from its inception the utility industry had been full of spirit and enterprise, just now every plan for progress runs up against an impeneetrable barrier, stated H. P. Liversidge in talking about the job at hand. This barrier is the trend in national affairs that, if continued, will lead to inevitable destruction. This trend, if unchecked, will deprive the utilities of having anything to say about their own future, and even now stifles initiative and enterprise. Thus the job confronting the utility industry and all industry is to be big enough, courageous enough and intelligent enough to overcome the forces of demoralization. If this social revolution is stopped, Mr. Liversidge believes the time is ripe for a great increase in the economic status of this country. He called for action by all thinking people to aid in bringing about victory over the forces of destruction intrenched in political fortresses at this time.

Sales problems discussed

Problems in domestic load building were discussed by P. H. Powers of West Penn Power Company. He pointed out the three basic elements in working out sales. The engineering and rate analysis, the market statistics on customers and markets and those associated with business judgment and merchandise acumen. The last element gives effectiveness to the two others and gives opportunity for the greatest improvement. In illustrating the principles stated Mr. Powers used data from a customer survey. In his opinion more data and more experience are needed and if used intelligently will permit the industry to build domestic business to an unpredictable height.

Conditions in industrial power sales were discussed by George H. Whitwell of the Philadelphia Electric Company. The three main problems to be met today are (1) present conditions in the markets, (2) the existence of some non-equitable and non-economic industrial rates and (3) the difficulty of a correction of the unbalance if too great a difference exists between industrial rates and those for other classes of services.

He particularly urged industrial men to make a study of their service records to industrial customers over the past few years and also to study the decrease in the spread between the cost of central station power and competitive power during the past two years, as against the spread that existed ten to fifteen years ago. He showed that competing costs had averaged a very material reduction.

Mr. Whitwell pointed out that successful application of the market analysis for new and added applications of electric power and the proper use of light in industry, as well as co-operation between the manufacturer and the utility, are essential to proper development of the market.

Advertising to the industrial customer, which must necessarily be of the indirect mail type, should be of the rifle shot variety, as against the buck shot.

"Business," Mr. Whitwell emphasized, "may be held at prices above competition. Once lost, it can only be regained by prices which go below competition."

"I submit that the maintenance of market acceptance among industrial power customers will only reach maximum success through flexible, reasonable handling of complaints, service troubles and abnormal situations."

In conclusion, Mr. Whitwell indicated that there were signs of continued opportunity for some time to come for power companies to obtain considerable increases in revenue from industrial power customers. "Demands for replacement have piled up, money is cheap, unwise investments have been largely liquidated and people generally are ready to spend money for consumer goods. Let us know and meet the problems presently surrounding industrial power sales. Let us do nothing in order to gain a temporary advantage with some other class of business that will tend to harm their development. I am sure that in these directions lie the best interests of the public, the investors, utility employees, and the utilities themselves."

An able discussion of the commercial customer, who is so frequently overlooked in the utility business, was presented by H. M. Sawyer of the American Gas & Electric Company. With emphasis so great on domestic and industrial business, the industry is apt to neglect commercial business. Yet this business is now susceptible of great increase and is of very great economic importance to the utilities.

A feature address was given by F. R. Phillips, president Philadelphia Company, on the opportunities and responsibilities of the employees of the industry. S. W. Utley, president of the National Steel Castings Company, gave a splendid address, pointing out the fallacies in present national policies that contemplate the dictation of government over business. Dr. G. W. Dyer similarly gave a succinct analysis of present trends and urged all to combat movements that history had proved ineffective and destructive.

A. J. Althouse was elected president, to succeed E. W. Judy, and I. L. Craig, D. A. Elias, H. M. Parkinson vice-presidents. Entertainment and social features were of their usual high caliber and the meeting was acclaimed by all who attended.

Illuminating Engineering Society Presents Diversified Program

Coupling technical advances with forward strides in lighting sales, the program of the Illuminating Engineering Society's 29th annual convention thus made a wholesome contribution to the to-be-reinvigorated program of better light to see by. The sessions were held at Cincinnati September 3-6. Such diversified areas for technical perfection of the new trends in illumination as cove lighting, louvered lighting, fenestration effects in walls and ceiling were discussed in geometric and photometric detail by Messrs. C. S. Woodside, J. L. Stair, L. H. Graves and H. L. Logan.

Established as is the trend toward higher levels of illumination intensity, it carries with it the need that the installations and attendant glassware be designed in full correlation in order that comfort may accompany bettered vision. A. B. Oday and Walter Sturrock, engineering department, General Electric Company, Nela Park, Cleveland, were joined by Dr. M. Luckiesh, director of the lighting research laboratory at Nela Park, and Frank K. Moss, also of the research laboratory, in pointing to the combination of general and supplementary illumination as affording the most feasible approach to ideal and practical light for seeing.

Highway lighting came in for its share of attention. K. M. Reid and H. J. Chanon, in their paper outlining the lessons learned from the model highway at Nela Park, emphasized the importance of silhouetting in highway discernment. O. P. Cleaver summarized the experience gained from the several trial installations of sodium-vapor and high-intensity mercury-vapor lighting. He cited 100 of the former and 200 of the latter for other uses as well as of highway illumination and suggested that installations involving combination luminaires for use of both "Mazda" and the high-efficiency vapor sources could well wait until more progress has been made in the design of the corresponding luminaires.

Prof. C. D. Fawcett reported on the survey of lighting education, finding that illumination courses are being eliminated from the four-year electrical engineering curricula, but being prescribed more generally among the five-year courses.

Opening sessions were allocated to the National Lighting Sales Conference, held under the auspices of the I.E.S. committee on lighting service. Sales executives here discussed the problem of training staffs for lighting sales and of the cultivation of the public market by cooperative effort on the part of manufacturers, jobbers and utilities.

An electric light bulb providing Vitamin D, the "sunshine vitamin," with complete freedom from danger of sunburn, has been developed by Dr. George S. Sperti and was shown for the first time at the convention. Protection against rickets in children and against the results of calcium deficiency in adults can now be given, according to the announcement made by the General Foods Corporation, by irradiation with no danger of overexposure.

Electric Rate Cuts Estimated at $60,000,000

Consumers of electric power are being saved approximately $60,000,000 this year because of rate reductions effected by public and private power companies, according to figures and estimates made public last week by Basil Manly, vice-chairman of the Federal Power Commission. Municipal plant reductions amounted to 5.86 per cent, he said, while those of private utilities amounted to 3.48 per cent. The study of rate reductions made through the electric rate survey includes reports from 1,925 of the 3,200 private and municipal utilities. These reports, Mr. Manly explained, cover more than 90 per cent of the total electrical energy sold in the United States.

The total annual savings reported for the last fiscal year amounted to $47,460,618, as a result of decreases in rates put into effect during the period by 480 of the 1,010 private companies and by 270 of the 915 municipal utilities reporting.

The savings of the municipal utilities announcing reductions amounted to $2,200,141, those of the private utilities to $45,260,477.

The survey covers the period from July 1, 1934, to June 30, 1935. Since that date twelve companies which have announced changes in charges, Mr. Manly said, "estimate savings amounting in the aggregate to something more than $13,000,000."

Weadock hits government interference

In commenting on the Federal Power Commission's statement, Bernard F. Weadock, vice-president and managing director of the Edison Electric Institute, said: "There is nothing new in the electric rate reductions as shown in the survey of the Federal Power Commission. Such reductions have been known to regulatory bodies and the electric light and power industry over a long period of years. It has been the pride of the industry to pass on to its customers, as rapidly as business conditions would permit, all economies resulting from advances in the art. Since 1913 the average price of domestic electric service has declined by 40 per cent, while over the same period the cost of living has risen by substantially the same percentage. Since 1925 this reduction in electric rates has averaged more than 3 per cent per annum.

"These reductions have occurred under the present system of regulation, which does not include federal interference. Government interference with business, rather than government regulation of business, has never reduced costs of a commodity, and electric rates are no exception. It is not likely, however, that this splendid record of rate reductions can be continued, in view of the unjust burdens placed upon the industry by the federal public utility act of 1935."

Spirited Discussions Feature A.I.E.E. Meeting

At the convention of the American Institute of Electrical Engineers held recently in Seattle (ELECTRICAL WORLD, August 31, page 46) sessions on power transmission and distribution produced some excellent papers and spirited discussion. E. D. Eby, General Electric Company, presented a paper describing the design of coupling capacitors being furnished for the Boulder Dam-Los Angeles line. In his discussion of Mr. Eby's paper, L. R. Ludwig, Westinghouse Electric & Manufacturing Company, pointed out the working stresses indicated in the paper were considerably in excess of his company's practice, resulting in a design which, in his opinion, represents a hazard to the line unless protective equipment, such as lightning arresters, is also provided. Mr. Ludwig stated that with the low working stresses employed in his company's design, the coupling capacitor is simply another string of insulators, from a hazard standpoint. He pointed out that more than three times as much working material is required for a stress of 125 volts per mil as compared with 220 v.p.m.

To the session on electrical machinery M. D. Ross, Westinghouse, contributed a paper describing a means of determining distribution of losses in various machine parts. In his discussion of this paper R. E. Hellmund, also Westinghouse, pointed out that the curves given in the paper are particularly valuable in the rating of electrical machinery where intermittent duty cycles have to be precalculated.

C. R. Reid's paper described the several types of equipment available for the production of steam from electric energy and outlined the field of application for such equipment.

Control of water heater load

In his paper F. M. Starr, General Electric, gave a discussion of the control of water heater load during off-peak periods. He showed the more economical control to be time switch with low concentration of water heaters and carrier current with high concentration.

A discussion by J. S. Parsons, Westinghouse, pointed out that while carrier-current equipment should be quite reliable, there is always the possibility that it may fail just as any other equipment, and when it does a large number of water heaters will be affected, whereas the failure of a time switch affects only one heater. He feels that to justify carrier-current control its greater flexibility must make it possible to reduce the new investment in the power system necessary to carry the water-heater load below that required when using time switches sufficiently to offset the greater investment in control equipment. In closing his paper Mr. Starr called attention to the fact that time-switch control has the disadvantage that all time switches must be reset after a power outage.

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T.V.A. Bill Signed; Labor Standards Adopted

With Senator Norris of Nebraska and Representative Rankin of Mississippi as witnesses, President Roosevelt signed the Tennessee Valley Authority bill, the provisions of which were published in ELECTRICAL WORLD, August 31, page 44. On the ground that the emergency peak had passed, President Roosevelt signed an executive order last week placing the administration expenses of the last seven recovery agencies under the Director of the Budget as of October 15. Included among the agencies was the Tennessee Valley Authority.

Adoption of an employee relationship policy governing labor standards, employee collective representation, hours of work, rates of pay, classification and general employment conditions has been announced by the three directors of the Tennessee Valley Authority.

COMING MEETINGS

National Electrical and Radio Exposition — Grand Central Palace, New York, N. Y., September 18-28.

National Electrical Contractors Association—Annual convention, Chicago, Ill., September 23-25.

International Association of Electrical Inspectors—Western section, St. Louis, Mo., September 16-18; Southern section, Asheville, N. C., September 30-October 2; Eastern section, Boston, Mass., October 7-10. Victor H. Tousley secretary-treasurer, 612 N. Michigan Avenue, Chicago, Ill.

Association of Iron and Steel Electrical Engineers—Annual meeting, William Penn Hotel, Pittsburgh, Pa., September 24-26. T. B. Little, acting managing director, Empire Building, Pittsburgh, Pa.

American Welding Society—Fall meeting, Palmer House, Chicago, Ill., September 30-October 4.

Empire State Gas and Electric Association — Annual meeting, Westchester Country Club, Rye, N. Y., October 4-5. C. H. B. Chapin, Grand Central Terminal, New York City.

National Electrical Manufacturers Association — Annual meeting, Palmer House, Chicago, Ill., October 7-11. W. J. Donald, 155 East 44th Street, New York.

Electrochemical Society—Fall meeting, Washington, D. C., October 10-12. Colin G. Fink, secretary, Columbia University, New York.

National Association of Railroad and Utilities Commissioners—Annual convention, Nashville, Tenn., October 15-18. John E. Benton, general solicitor, 806 Earle Building, Washington, D. C.

National Electrical Wholesalers' Association—Annual convention, Chicago, Ill., October 14-18. E. Donald Tolles, managing director, 165 Broadway, New York.

American Institute of Electrical Engineers—Great Lakes District meeting, Purdue University, West Lafayette, Ind., October 24-25. H. H. Henline, national secretary, 33 West 39th Street, New York.

Work on Parker Dam Resumed at Ickes' Order

Last week President Roosevelt fixed his signature to the rivers and harbors act, which specifically authorized the construction of the Parker Dam across the Colorado River, 145 miles below Boulder Dam, and the construction of the Grand Coulee Dam across the Columbia River in Washington. Both projects had been jeopardized and work on the Parker Dam had been held up since April 30 by a decision of the Supreme Court requiring the specific consent of Congress to construction of the project. Immediately after the bill was signed Secretary Ickes ordered work resumed.

Construction work on Grand Coulee Dam in Washington has been in progress for the past eighteen months. The Supreme Court decision did not apply specifically to this structure. Its inclusion in the rivers and harbors act removes any objection that might be raised as to legal authorization for its construction.

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Interior Wiring Handbook Prepared by Industry Groups

Groundwork for preparation and promotion of a Handbook of Interior Wiring Design for architects, consulting engineers, general and electrical contractors and others was laid at the first meeting of a joint industry committee in New York City August 14. Edward A. Brand of Buffalo was chosen permanent chairman at the session. Organization of the committee was at the invitation of the Edison Electric Institute sales committee. A second meeting will be held some time during the month. Appointment of a technical subcommittee to prepare the detailed design and specific data, and assignment of other parts of the handbook, which has been developed in outline, marked the initial meeting.

• Associations represented on the committee include: American Institute of Architects, Artistic Lighting Equipment Association, Edison Electric Institute, Illuminating Engineering Society, International Association of Electrical Inspectors, National Electrical Contractors' Association, National Electrical Manufacturers Association and National Electrical Wholesalers Association.

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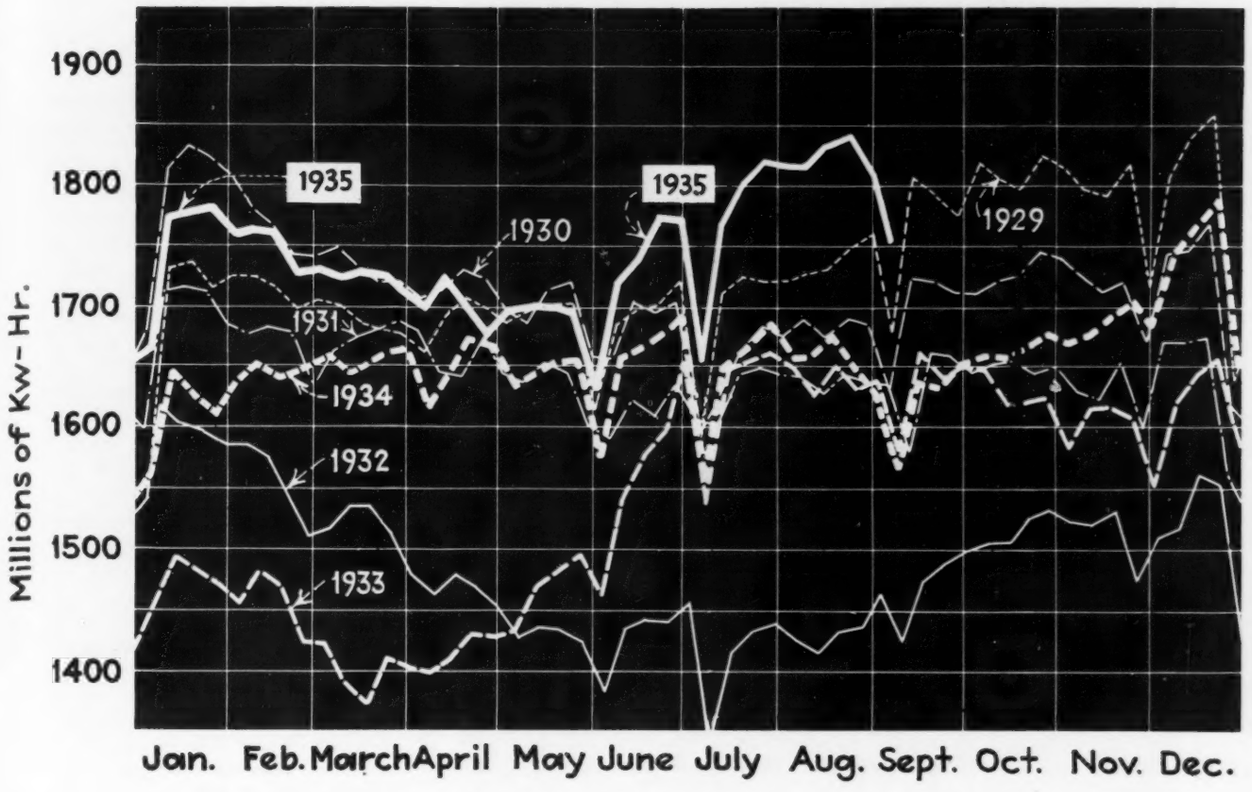
Duke-Price Power Renamed

Announcement has been made that the Duke-Price Power Company, Montreal, Que., has changed its name to Saguenay Power Company, Ltd. The new name does not imply any change in control or policies.

Output 12 Per Cent Over 1934



Electrical energy output of central stations continues larger than at this season of any other year, with a gradually increasing lead over 1934 that has now grown to 12 per cent and an excess over 1929 that has hovered around 5 per cent for the past two months.

Production of 1,809,716,000 kw.-hr. in the week ended August 31, according to the Edison Electric Institute, indicated a moderate recession from the high point of the preceding week but the drop to 1,752,066,000 kw.-hr. in the week including Labor Day was smaller than in 1929 and left the gain over that year at 4.7 per cent.

In the regional figures the most striking feature is the excess over 1934 in the Rocky Mountain area, now risen to 44.2 per cent. Much greater activity is reflected also in the industrial sections, notably New England and the Middle West, where the electrical energy output is more than 12 per cent ahead of last year's.

Weekly Output, Millions of Kw.-Hr.

1935	1934	1933
Sept. 7...1,752	Sept. 8...1,565	Sept. 9...1,583
Aug. 31...1,810	Sept. 1...1,627	Sept. 2...1,637
Aug. 24...1,840	Aug. 25...1,648	Aug. 26...1,630
Aug. 17...1,833	Aug. 18...1,674	Aug. 19...1,650
Aug. 10...1,819	Aug. 11...1,659	Aug. 12...1,627
Aug. 3...1,821	Aug. 4...1,658	Aug. 5...1,650

Per Cent Change from Previous Year

Region	Week ended Sept. 7	Aug. 31	Aug. 24
New England	+12.5	+ 9.0	+ 9.4
Middle Atlantic	+ 8.0	+ 7.8	+ 9.3
Central Industrial	+12.7	+13.3	+12.7
West Central	+10.5	+ 9.6	+ 9.5
Southern States	+13.4	+ 8.8	+ 8.5
Rocky Mountain	+44.2	+37.6	+37.7
Pacific Coast	+ 6.7	+ 7.9	+ 8.5
United States	+12.0	+11.2	+11.6

July Output Overshoots 1929

More energy was generated for public use in July than in the same month of any previous year, the U. S. Geological Survey reports. The total was 8,350,000,000 kw.-hr., against the revised figure of 7,817,000,000 kw.-hr. for June, 7,617,000,000 kw.-hr. for July, 1934, and 8,072,260,000 kw.-hr. for the same month in 1929, which until now has been the maximum. The gain of 10 per cent over 1934 was the largest for any month this year; the increase of 3.5 per cent over the like month in any previous year also sets a new record for recovery.

Accelerated consumption is further shown in the unusual circumstance that July production was equal to that of the preceding January, and average daily output was 2.6 per cent above the average for June, whereas the normal change from June to July is a decrease of 1.6 per cent.

Production from water-power continues to be unusually large. It was 43 per cent of the total in July, 44 per cent in June, 46 per cent in May. Last year in July it was only 34 per cent of the total.

Gains over 1934 were general throughout the country, with the Rocky Mountain and East South Central regions leading, as the table shows.

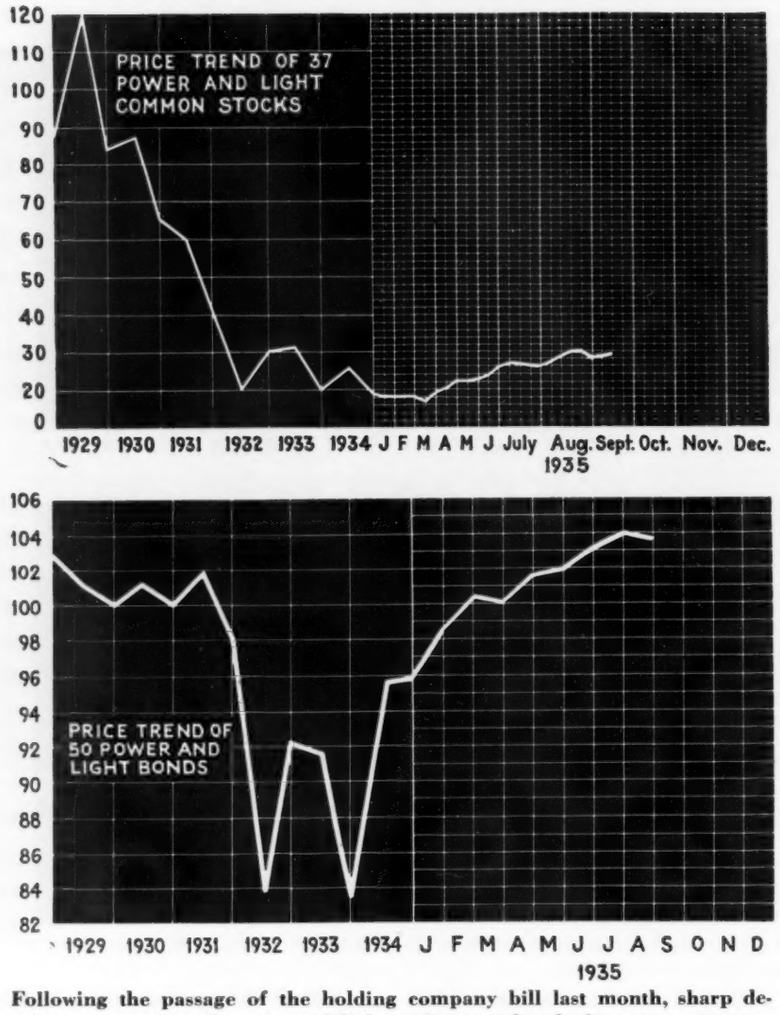
Regional Gains Over 1934, per Cent

	April	May	June	July
United States	+ 5	+ 4	+ 5	+10
New England	+ 5	+ 3	+ 8	+ 9
Middle Atlantic	+ 3	+ 3	+ 4	+10
East No. Central	+ 6	+ 3	— 3	+ 7
West No. Central	+21	+15	+18	+14
South Atlantic	+ 4	+ 7	0	+ 8
East So. Central	+ 9	+ 4	+28	+21
West So. Central	+ 9	+ 5	0	+ 6
Mountain	+12	+15	+35	+36
Pacific	— 6	— 2	+ 7	+ 5

Canadian Output Up

Central electric stations in Canada produced 1,790,546,000 kw.-hr. during July, as against 1,621,314,000 kw.-hr. in July, 1934, an increase of 10.4 per cent, according to a report issued by the Dominion Bureau of Statistics. Exports to the United States declined from 107,994,000 kw.-hr. for June and 105,866,000 kw.-hr. for July last year to 93,347,000 kw.-hr.

Utility Securities Recover



Following the passage of the holding company bill last month, sharp declines occurred in the prices of light and power bonds, but some recovery took place later. *Electrical World* index: July, 104.1; August, 103.7. Stocks also regained some of the ground lost. *Electrical World* index: Last week, 28.8; this week, 29.3.

Utility Issues Registered

Application has been filed by the Detroit Edison Company with the Securities and Exchange Commission in Washington for an issue of $49,000,000 of 4 per cent bonds to be used for refunding purposes.

Pacific Gas & Electric Company has filed with the San Francisco office of the commission a registration statement covering a proposed issue of $20,000,000 of first and refunding series G 4 per cent bonds due on December 1, 1964. Proceeds will be used to redeem the outstanding issue of $20,000,000 first and refunding series D 5 per cent bonds of 1955.

Consumers Power Company, Jackson, Mich., has filed a registration statement for $19,172,000 first lien and unifying mortgage bonds. This is the second filing within three months under the securities act by Consumers Power. Last June the company filed an application for an $18,594,000 issue. Proceeds of the new issue are to be used in part for refunding and to reimburse the company for expenditures for improvements and additions to its property.

Employees of the Associated Gas & Electric Company and its numerous affiliates will have the opportunity of buying $10,000,000 in bonds of the Utilities Employees Securities Company, if a registration statement recently filed with the Securities and Exchange Commission is approved. This issue is to be offered at face value and accrued interest directly to the employees of companies in the Associated system. The interest rate, subject to provisions of the bond indenture, will be 6 per cent. Approximately $4,500,000 principal amount of the bonds will be available to employees who now hold the outstanding income bonds of the company in exchange on a par-for-par basis. The latter, when so exchanged, will be retired and canceled. Proceeds from the sale of the remaining bonds will be used to invest in securities, principally those of utility holding and operating companies.

•

P.W.A.-W.P.A. Differences Delay Public Power Projects

Differences over policy between Public Works Administrator Harold L. Ickes and Works Progress Administrator Harry L. Hopkins have delayed the program of municipal power plant construction, involving more than 200 projects. Several applications for municipal power plants on a loan-grant basis have recently been rejected by the W.P.A. after the P.W.A. had given its approval and submitted the projects to the Hopkins organization for the grants. In each case application was made under the loan and grant system which provides that the government grant 45 per cent of the cost out of the $4,800,000,000 works progress fund if the municipality will raise the balance.

Among the rejected cases are the following: Union Springs, Ala., power project providing for loans and grants of $65,055; Exira, Iowa, power project providing loans and grants of $74,545; Sebring, Fla., power project costing $63,636; Glenwood, Minn., $150,909; Eveleth, Minn., $886,000; Moneth, Mo., $140,000; Oskaloosa, Iowa, $461,818; Eufaula, Okla., $78,181.

Last week P.W.A. announced the complete approval on a loan and grant basis of several municipal power plant projects. Loan and grant of $420,000 were made to the city of Jacksonville, Ill., for a municipal power plant, distribution system and street lighting system. The loan of $231,000 will be made from P.W.A. revolving fund and the grant of $189,000 will be paid from the work relief appropriation. Jamestown, N. D., was given a loan and grant of $743,636 for a municipally owned power plant and electric distribution system, 55 per cent of the total to be loaned by P.W.A. and 45 per cent granted by W.P.A. A loan and grant of $200,000 were made to the city of Paragould, Ark., for constructing a municipally owned power plant and electric distribution system. Arkansas Utilities Company has just brought suit to block the allotment.

New York Metal Prices

	Aug. 28, 1935 Cents per Pound	Sept. 11, 1935 Cents per Pound
Copper, electrolytic	8 50*	8 275*
Lead, Am. S. & R. Price	4 35	4 35
Antimony	12 50	12 50
Nickel ingot	35 00	35 00
Zinc spot	4.975	4 60
Tin Straits	49 125	48 50
Aluminum, 99 per cent.	19—21	19—21

*Delivered Connecticut Valley

MANUFACTURING AND MARKETS

Favorable Business Items

Utility loads continue to increase.
Stock market maintains upward trend.
Heavy industries continue to gain.
Electrical sales and negotiations active.
Optimistic attitude gaining ground.

Unfavorable Business Items

Commercial bank loans still at low value.
No marked change in unemployment.
Labor situation serious in some industries.
Long-term investment commitments slow.
Budget-making slows up purchasing.

New York Electrical Show To Open September 18

Under the sponsorship of the Electrical Association of New York, the 1935 Electrical and Radio Exposition, which will be held in Grand Central Palace September 18 to 28, is expected to be the most comprehensive and complete display of the latest advances in the fields of domestic and industrial appliances and services and radio yet held. The exposition enlists the support of the most important electrical and radio manufacturers and distributors.

One of the most interesting and informative features will be the Hall of Science, in which the marvels of modern science and electrical research will be shown and the hundred and one developments in this little-understood field will be demonstrated from the standpoint of the man in the street.

This exposition will give the consuming public an opportunity to get a real picture under one roof of just what an important and essential part electrical equipment and electrical services play in modern life. The advance made in electrical refrigeration, in heating, in lighting, in air conditioning methods and appliances, in the field of oil burners, in electrical cookery, in the whole line of electrical appliances and equipment intended for domestic and industrial use, will all be presented.

•

N.E.M.A. Establishes New Dues Rate Procedure

Under the provisions of the by-laws of the National Electrical Manufacturers Association the board of governors will apportion among the divisions, sections and groups the total amount of the general association budget, the dues to be based upon the amount and character of service rendered. In the first year 1934-35 there have been only 22 product classifications for which rates of dues were established.

Under a new procedure, established with the advice of the accounting firm of Peat, Marwick, Mitchell & Company, there will now be 85 or more subdivisions for which rates of dues will be established on the cost-of-service basis. Each of these subdivisions is known as a dues center. It may be a division, section or group of N.E.M.A. From time to time the number of dues centers will change, but except for newly organized sections, groups or subgroups no changes will be made in dues centers within a budget period.

The amount charged to each dues center is determined on the cost-of-service basis by using accounting methods which provide approximately as accurate results as those obtained by a job cost system in a factory.

•

British Regain U. S. Interest In General Electric Company

As the result of a deal carried out by a London syndicate, headed by Lazard Brothers & Company, for the repatriation of a block of shares of the General Electric Company, London, from American interests, this enterprise is British-owned once more. For approximately £1,200,000 ($6,000,000) the London group has purchased 400,000 shares in the General Electric from United States holders. As the result of the acquisition, it is understood that, apart from a few holdings of small private investors abroad, the whole of the British General Electric's shares are now held in Britain.

The capital of the General Electric is now £7,500,000 ($37,500,000), the ordinary capital having been increased by £2,000,000 this year for the purpose of repaying the 4¼ per cent debenture stock, thus clearing the company of all debenture debt.

•

G.E. Increases Dividends

A quarterly dividend on the common stock of 20 cents a share—5 cents higher than last quarter—was declared by the directors of the General Electric Company at their meeting in New York City, September 6. The dividend is payable October 25 to stockholders of record September 27.

At the meeting, also, Leon Fraser, vice-president of the First National Bank of New York and formerly president of the Bank for International Settlements, was elected a director of the company.

•

Chicago the Mecca

Electrical manufacturers, wholesalers and contractors are holding their conventions in Chicago this year. The contractors meet September 23, the manufacturers October 7 and the wholesalers October 14. Early reports indicate a large attendance at these meetings, with an optimistic outlook on business. The present up-turn in business has been felt in large measure by these electrical groups and the convention plans call for active and aggressive efforts in sales and sales promotion.

•

Credit Association Reports Fewer Outstanding Accounts

Members of the National Electrical Credit Association, including both manufacturers and wholesalers in the electrical, radio and automotive fields, report an increase in sales during July as compared with June, with a smaller percentage of outstanding accounts at the end of the month.

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Refrigerator Sales Gain Substantially in July

Domestic sales in July of electric refrigerators for household purposes totaled 140,250 units, with a value of $11,020,929, according to reports from fourteen companies submitted to the National Electrical Manufacturers Association. Sales for the first seven months of this year totaled 1,146,231 units, with a value of $88,374,077.

Sales to Canada and other foreign countries in July amounted to 12,114 units with a total valuation of $896,409. World sales totaled 152,364 units, valued at $11,917,338, during the month.

Based on 1934 reports from thirteen to sixteen companies, domestic sales in July last year totaled 101,511 units, with a value of $8,600,649, and for the first seven months of 1934 the domestic sales of these companies amounted to 944,511 units, valued at $79,516,215.

Commercial sales in this country in July totaled 11,824 units, with a valuation of $1,351,063, based upon the reports of nineteen companies, and world sales of these manufacturers had a valu-

ation of $1,513,832, the number of units being sold amounting to 13,674, according to the association.

•

Condenser Patents Upheld in Court Decision

The Ruben dry electrolytic condenser patents Nos. 1,710,073 and 1,714,191 have just been upheld by the United States District Court for the Eastern District of New York. In an opinion by Judge Marcus B. Campbell in the case of Ruben Condenser Company and P. R. Mallory & Company, Inc., against Copeland Refrigeration Corporation the court declared both patents valid, and also held them infringed by dry electrolytic condensers made by Delco Products Corporation and supplied to Copeland in conjunction with electric motors. The decision directs the entry of a decree for injunction against future infringement.

P. R. Mallory & Company, Inc., Indianapolis, is the exclusive licensee under patents 1,710,073 and 1,714,191 as well as other Ruben patents relating to dry electrolytic condensers. Sub-licenses are held by the Magnavox Company, Sprague Specialties Company, Cornell-Dubilier Corporation, Condenser Corporation of America and the Aerovox Corporation.

•

$6,300,000 Exports

Exports of electrical goods during June were valued at $6,302,220, according to an advance report issued by the Electrical Division, Department of Commerce. Exports in May were $6,902,103 (ELECTRICAL WORLD, August 3, page 50). The report gives details by commodities and by countries. Leading buyers were: Canada $801,005, United Kingdom $480,445, Mexico $378,389, Union of South Africa $372,301, Brazil $272,331, Australia $268,634, France $267,207, Argentina $264,667, Uruguay $251,801.

•

Marblehead Opens First "New American" Home

Public interest in the idea of the "New American" home has been evidenced in Marblehead, Mass. On the official opening of this first dwelling to be built as a result of the General Electric Company's recent architectural competition 20,000 people visited the house on the first day to see its electric kitchen, laundry, workshop and air conditioning. The crowds continue pouring through the house, which will be open for inspection for two months. Within a few days of the opening the builder had sold two lots on adjoining land and a completed house next door. This is a forerunner of what may be expected when the nation-wide exhibition of "New American" homes begins in October.

About 500 of these demonstration homes, built from prize-winning designs, are now being constructed about the country and 1,000 will be completed by October. Each house is sponsored by a local committee consisting of the local G.E. manager and wholesaler, local architects, builders, contractors, dealers and the utility. The power companies are naturally co-operating everywhere.

The "New American" home program in October will be supported by extensive magazine and newspaper publicity, calculated to arouse public interest all over the country.

First "New American" home just opened in Marblehead, Mass., inspected by 20,000 the first day

It is equipped with electric kitchen, laundry, workshop and air conditioning.

F.H.A. Issues Booklet on Equipment Eligibility

Manufacturers, contractors and dealers in electrical equipment are particularly interested in the policy of the Federal Housing Administration in regard to the eligibility of electrical equipment and machinery that can be obtained under the Modernization Credit Plan with funds provided by private financial institutions.

A booklet just released by the Housing Administration lists types of equipment and machinery that have been ruled eligible for loans up to $50,000 for apartment houses, multi-family houses, hotels, office, business or other commercial buildings, hospitals, colleges, orphanages, schools and manufacturing or industrial plants generally specified as Class A properties. It also gives the policy, in detail, in regard to loans up to $2,000 on other types of property, referred to as Class B properties.

Electrical equipment eligible for manufacturing and industrial plant loans up to $50,000 include all production machinery adaptable to the business, which is purchased and installed on a property already improved by or to be converted into a manufacturing or industrial plant, subject to the general principles which govern the Administration's determination of eligibility for equipment and machinery.

Electrical equipment for single-family dwellings can be obtained on loans not exceeding $2,000. The equipment ruled to be eligible for the home is that which is necessary to make a home a complete operating unit in a domestic sense. Eligible items include such "fixtures" as heating systems, wiring and plumbing systems, etc. In addition, refrigerators, whether mechanical or ice, are eligible. Likewise, cooking ranges (whether electric, coal, gas, oil or wood operated), washing machines, ironing machines and unit air conditioners are eligible. Portable hand appliances and tools such as toasters, vacuum cleaners, hand irons, lamps, percolators and portable electric, gas and oil heaters are ineligible.

Electrical equipment or equipment using electricity that is eligible for the home includes air-conditioning equipment (including humidifiers).

•

Electric Washer Shipments

Household washing machine shipments in July totaled 109,475 units, an increase of 25 per cent over the similar month of 1934 and a gain of 16 per cent over June, according to a statement made by J. R. Bohnen, secretary of the American Washing Machine Manufacturers Association. Electrical washers were shipped in the amount of 93,815 units, an increase of 17 per cent over July, 1934. Ironer shipments totaled 10,737 units, against 9,562 a year ago.

It's time to ask yourself:

ARE THE OPERATING SPEEDS OF OUR OIL CIRCUIT BREAKERS ADEQUATE? AND HOW ABOUT THE EXPENSE TO MAINTAIN THEM?

To be safe and sure

Modernize by adding oil-blast ...and do it NOW

You will avoid subjecting your old G-E breakers to short circuits beyond their ratings caused by operating conditions which have become more severe since these breakers were installed. You will benefit from the better operating characteristics that oil-blast provides.

Oil-blast improves breaker performance. Arcing time becomes more consistent and very much shorter. There is less burning of contacts and less carbonizing of oil—which reduces maintenance materially.

You can install oil-blast for only a fraction of the cost of new breakers. The change-over can be made easily and quickly. To install oil-blast usually takes only a little more time than is required for inspecting contacts and oil. Progressive companies have found that such modernization of their old breakers pays. Let us point out just what advantages you will get by modernizing *your* breakers. General Electric, Schenectady, N. Y.

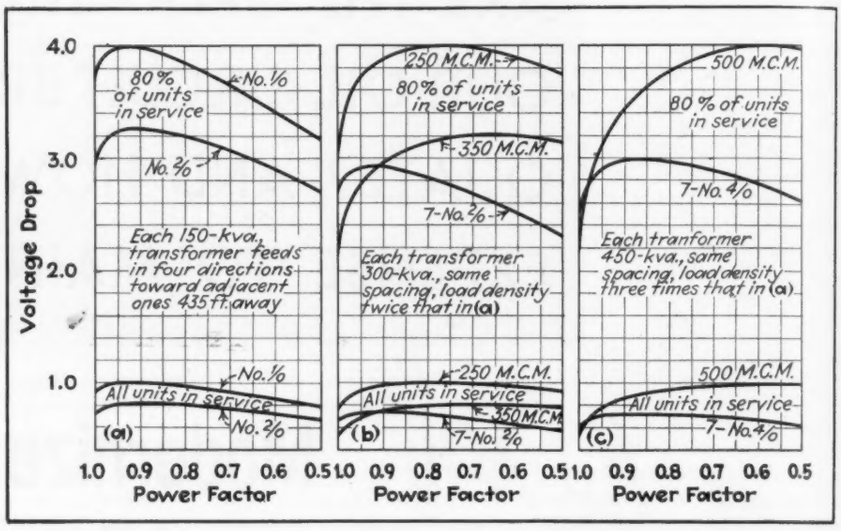
810-56

GENERAL ELECTRIC

Better Voltage with Small Network Cables

By LESLIE J. WEED
Electrical Engineer,
Edison Electric Illuminating Company
of Boston

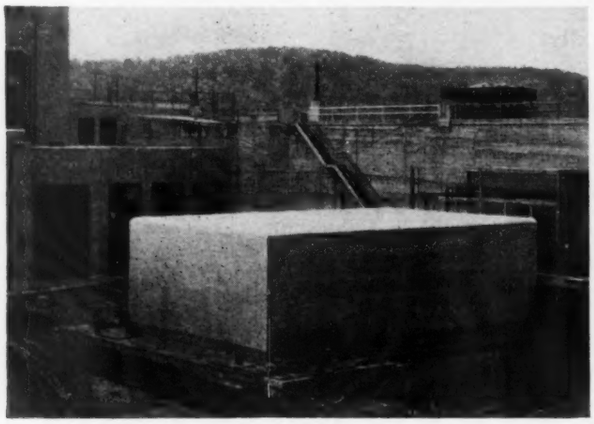
Calculation of the voltage regulation which will result on Nos. 1/0 and 2/0 network cable mains shows that the drop is four times as great when only 80 per cent of the 150-kva. transformer banks are in service as when all are functioning. These main sizes were substantiated in the March 2 and May 11, 1935, articles in ELECTRICAL WORLD for 150-kva. transformers at 435-ft. spacing. Normally each transformer is carrying 30 kva. of load for half the distance between units in each of four directions. When one fails the four others surrounding it have to carry 60 kva. over the full distance between units. Twice the load over twice the distance makes four times the voltage drop. The curves in the illustration indicate that the regulation is quite flat for these small-sized conductors over a unity to 0.50 range of power factor.

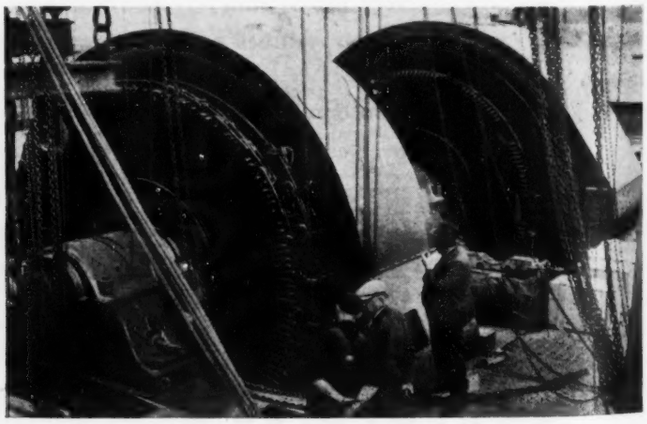


Voltage drop multiplies with one network transformer in five out of service

If twice as large (300-kva.) transformers are used, with the same 435-ft. spacing, the normal-condition cable loading will be a maximum of 167 amp. for the peak-load hours. With one transformer out of service the current in a main will rise to 334 amp. A 250,000-circ.mil cable (rated at 250 amp.) could carry 310 amp. for three hours, or a 350,000-circ.mil cable could carry 400 amp. for three hours, which is more than the customary 1 to 2-hour peak. With these conductors it is found that the voltage drop (Fig. a) is considerably greater at all power factors below 0.90 than for seven No. 2/0 cables arranged symmetrically concentric as a double-circuit main with the common neutral serving as a core. The variation in drop with power factor is greater for the larger cables because of the increased reactance, the maximum voltage drop of course occurring when the impedance angle of the conductor is

Outdoor Frequency Changer at Safe Harbor



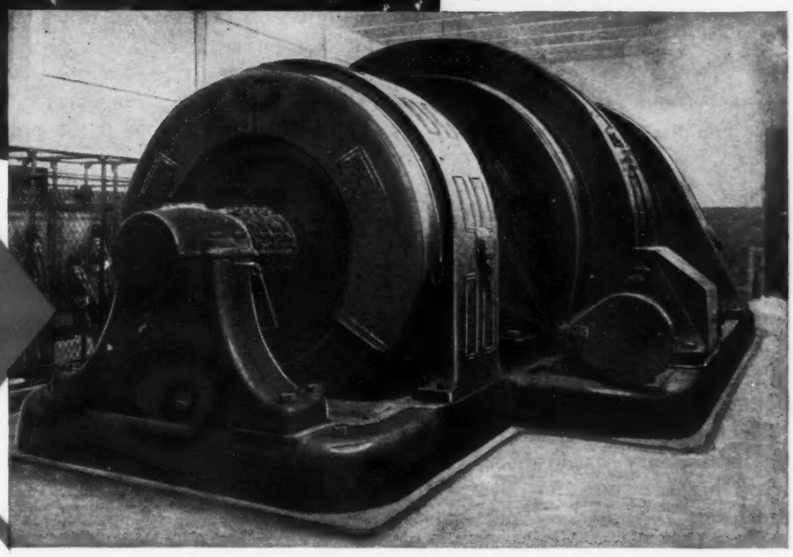


Providing a connection between its three-phase, 60-cycle system and the new 28,000-kw., 25-cycle, single-phase generator shortly to go into operation, the Safe Harbor Water Power Corporation has installed a 25,000-kw. frequency changer immediately outside the power house. The new generating unit is intended to supply power to the Pennsylvania Railroad electrification from Perryville, Md., to Washington, D. C. The frequency changer, the near end of which is 60 cycle and the far end 25 cycle, is rated at 80 per cent power factor, 300 r.p.m. and is spring supported. It is housed in the sheet-metal cubicle shown

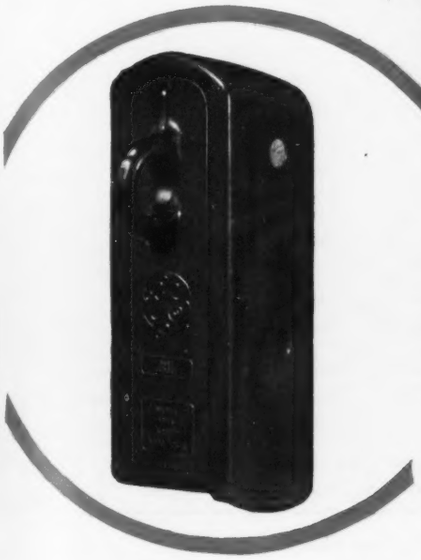
Exhaustive Tests Prove That G-E Fuse Cutouts Can "TAKE IT"

They're designed to give years of high-class protection to your circuits . . . .

This 10,000,000-volt impulse generator provides means for testing G-E fuse cutouts at lightning potentials



This machine, capable of delivering 27,500 amperes, supplies heavy short-circuit currents for testing G-E cutouts



IN THE development of fuse cutouts for lasting, high-quality protection to your circuits, General Electric engineers subject all new designs to these thorough tests, which far surpass any conditions that can exist in actual service. In this manner, any electrical or mechanical imperfections are discovered and eliminated in the experimental stage—*before* they can appear in service.

The result: a complete line of distribution fuse cutouts on which you can rely for years of dependable operation on your lines. Ask the nearest G-E office for further information, or write General Electric Company, Dept. 6A-201, Schenectady, N. Y.

340-17

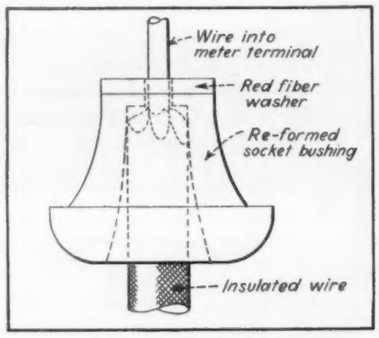
GENERAL ELECTRIC

equal to the power-factor angle. The multiple main also has a distinct advantage in the reduction of flicker caused by low power factor starting currents.

•

Protecting Open Meter Connections

One of the simplest dodges for stealing electricity in open-wiring meter installations is for the customer (?) to shunt the meter current coils by entering the meter terminal block



For discouraging jumpers

alongside the meter connections. Unless the inspector finds the jumper actually in place, it is practically impossible to catch the thief. However, a certain ingenious meter man recently devised a small accessory which is saving his company quite a few dollars by discouraging this particular kind of stealing.

The first unit was made by inserting an ordinary hard-rubber, lamp-socket bushing into an electrically heated mold and deforming it as shown. The end of the bushing has been partially closed over, the hole that is left being large enough for a No. 10 or No. 12 wire, but not large enough for the insulation around the wire to pass through. The bushing is slipped over the end of one of the wires going to the meter current coil connection. Then—and here is where the trick comes in—a small red fiber washer is also slipped on the wire. The assembly is now as it appears in the sketch. The wire thus protected is inserted in the meter terminal block and the connection screwed down.

If the customer inserts a stiff jumper wire it will break the bushing. But he does not know about that little red washer lying in ambush. When the sharp end of the jumper arrives in the terminal it scratches up that little red washer considerably, leaving definite traces of tampering. Even though the customer might argue that the bushing may have been broken by the frost or something, he will have considerable difficulty explaining scratches on the red washer, without involving himself. Possibly the customer will not then and there confess. But in nine cases out of ten he decides not to do it again if the inspector lets him go the first time.

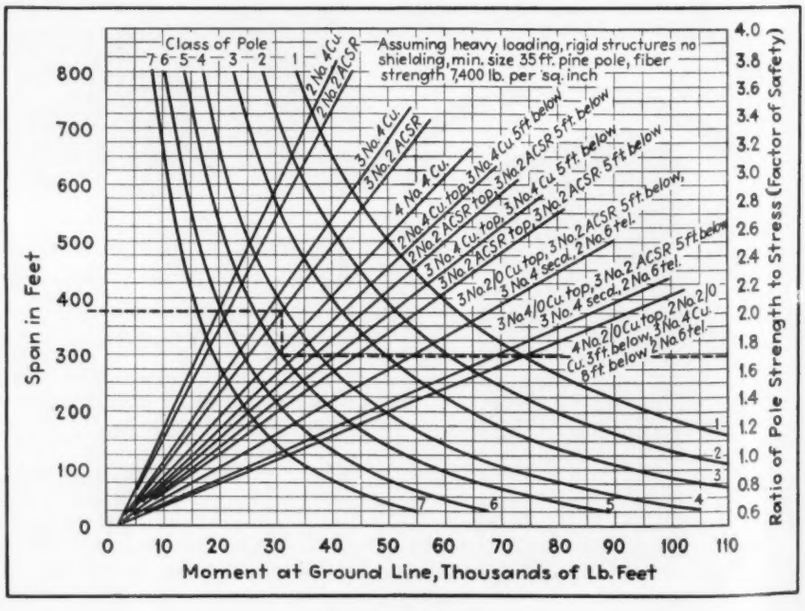
•

Loading Chart for Wood-Pole Lines

By MARTIN J. URNER
Potomac Edison Company

The chart presented herewith was developed to provide a simple and convenient method of selecting the proper class of wood pole for single-pole lines. It is equally usable for new lines or old lines in which poles must be replaced. By making a single calculation of pole loading for a given conductor arrangement and drawing a straight line at the proper location the relation of "Span Length" to "Ratio of Pole Strength to Stress" (safety factor) for any A.S.A. standard class of pole and any span length can be immediately determined. The comparative cost of various types of construction can be quickly checked with this chart. While only a few specific conductor arrangements are shown, any number can be added by (1) making a calculation for pole loading in terms of moment at the ground line for one span length, (2) adding a value of 2,000 ft.-lb. for wind pressure on the pole itself, (3) plotting the value obtained on the chart and (4) drawing a straight line to the common point of origin.

Calculations of pole loading for the several conductor arrangements shown are based on methods and assumptions of the National Electrical Safety Code for heavy loading conditions. These assumptions include ½-in. radial thickness of ice on the wires, a constant transverse wind pressure of 8 lb. per square foot and rigid supports. Since these assumptions in themselves provide liberal margins of safety, it must be borne in mind that the term "Factor of Safety," though commonly used, does not bear the same significance in wood-pole calculations that it does in other lines of engineering work. The term "Factor of Safety" is avoided in the safety code, and the term "Ratio of Pole Strength to Stress" is used instead. Ratios recommended in the safety code vary from as low as 0.66 to a maximum of 2 for high-voltage lines crossing main line railroads.


Class of Pole
7 6 5 4 3 2 1
Assuming heavy loading, rigid structures no shielding, min. size 35 ft. pine pole, fiber strength 7,400 lb. per sq. inch
2 No. 4 Cu.
2 No. 2 ACSR
3 No. 4 Cu.
3 No. 2 ACSR
4 No. 4 Cu.
2 No. 4 Cu. top, 3 No. 4 Cu. 5 ft. below
2 No. 2 ACSR top, 3 No. 2 ACSR 5 ft. below
3 No. 4 Cu. top, 3 No. 2 ACSR 5 ft. below
3 No. 2/0 Cu. top, 3 No. 2 ACSR 5 ft. below, 3 No. 4 secd., 2 No. 6 tel.
3 No. 4/0 Cu. top, 3 No. 2/0 3 No. 4 secd., 2 No. 6 tel.
4 No. 2/0 Cu. top, 3 No. 4 Cu. 3 ft. below, 2 No. 6 tel. 8 ft. below
Span in Feet
0 100 200 300 400 500 600 700 800
Moment at Ground Line, Thousands of Lb. Feet
0 10 20 30 40 50 60 70 80 90 100 110
Ratio of Pole Strength to Stress (Factor of Safety)
0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6 2.8 3.0 3.2 3.4 3.6 3.8 4.0

Pole-loading chart

The heavy dotted line indicates how the chart is used for a specific problem. For example, starting with a span length of 375 ft., proceed horizontally to a conductor arrangement of three No. 2 A.C.S.R. wires, thence vertically to a Class 5 pole, thence horizontally to a ratio (safety factor) of 1.7. Similarly the ratios for other classes of poles may be found for the same or other span lengths. Or, beginning with an assumed ratio, the maximum span length for any class of pole with a given conductor arrangement may be determined.

RECLOSING!

—

ADJUSTABLE TIME DELAY!

RECLOSES the circuit automatically after a predetermined interval, best suited to the line requirements.

The built-in time delay device can easily be adjusted, it will cut in the following fuse instantaneously or after any interval up to two seconds. It is foolproof.

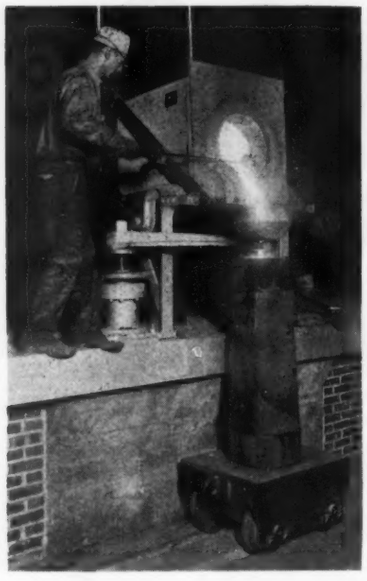
All cartridges are in the up or closed position when links are intact. After blowing, the cartridge drops down, can be located and replaced immediately.

Type RLD is available in 100 amps. capacity, in two- and three-gang construction, in ratings up to 15,000 volts.

LINE MATERIAL CO

SOUTH MILWAUKEE, WISCONSIN, U. S. A.

High Frequency Melts Magnet Steel



High-frequency induction furnaces are employed by Bethlehem Steel in making tool steels and "Cobaflux," which is a permanent magnet steel containing 38 per cent cobalt. There are two furnaces of 1,200 lb. capacity, two of 600 lb. capacity and a 14-lb. capacity unit for experimental purposes.

•

Multi-Motor Drive Aids Candy Making

Production conditions have been greatly improved at the candy factory of Edgar P. Lewis & Sons, Inc., Malden, Mass., by equipping a battery of four candy wafer machines with individual motor drives and adjustable-speed control where needed, doing away with about 50 ft. of line shafting and a dozen bearings per machine. Formerly each of these machines was driven by a single 15-hp. induction motor. Driving of the various parts involved no little mechanical complication, and there was a decided lack of flexibility in handling various types of candy material. These difficulties have been overcome by equipping each machine with seven U. S. Electrical Manufacturing Company dust-proof induction motors, with centralized manual control of Allen Bradley design and three emergency stop stations at suitable points on the frame.

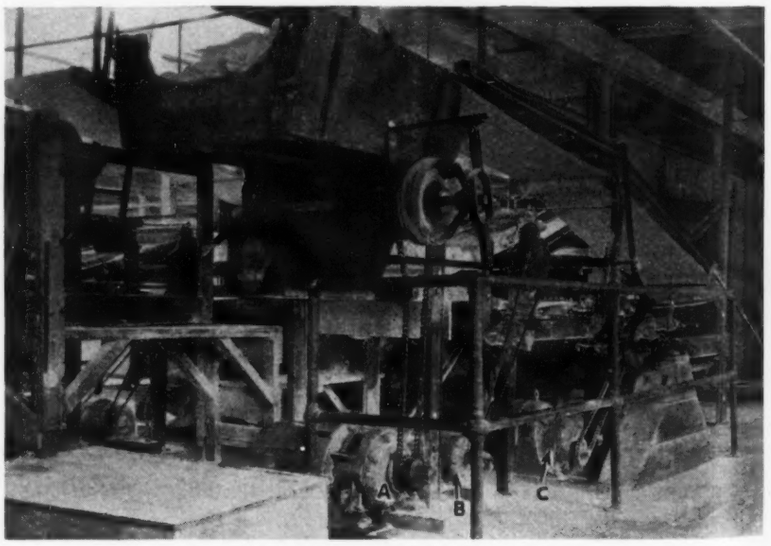
These machines receive wafer material from a batch mixer delivering the material into a main feed hopper equipped with worm-type grinders; from the hopper it is delivered to rolls discharging upon a conveyor belt passing under sets of plungers which stamp out the wafers; the product then goes via a chute and conveyor belt to steam driers and the sorting tables. Scrap material left after the stamping operation is automatically returned by conveyor belt to the main feed hopper.

The use of variable-speed motors at the points indicated enables the candy company to handle different grades of candy with maximum convenience, reducing waste to a minimum and pushing up production through the selection of the proper speeds for the material in process. The elimination of so many mechanical drive parts increases the cleanliness of the processing and enhances the safety of the work from the personnel standpoint. No accidents have occurred to employees around these units since the multi-motor drives were adopted. Inspection and maintenance are greatly facilitated by the new set-up.

•

Production-Line Heat Treating

At the factory of the Royal Typewriter Company, Hartford, Conn., miscellaneous springs, type bars, ball-bearing parts, bolts and screws are heat treated in a General Electric continuous-type electric oven equipped with conveyors and variable-speed motor drives to meet the production requirements of different material. The assembled unit includes a 45-kw., 220-volt oven for heating and soaking pur-



Complicated mechanical drives eliminated and production control improved by multi-motor drive

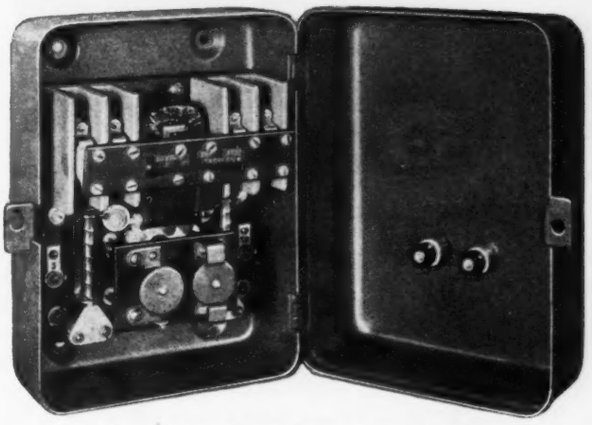
A—One 5-hp. motor, synchro-gear type, constant speed, 172 r.p.m., chain-driving the shaft, about 5 ft. above which runs the worms in the feed hopper. B—One ½-hp. motor, "vari-drive" type, speed range by smooth gradation, 174 to 58 r.p.m., chain-driving the rollers. C—One 3-hp., synchro-gear constant-speed motor, 127 r.p.m., chain-driving plungers for stamping wafers; two 5-hp. motors (not shown) driving batch mixer, constant speed, 1,200 r.p.m., and two motors (not shown) 1½ hp. each, variable speed, 43 to 21 r.p.m., driving automatic drier.

A.C. Automatic Motor Starters

with *compensated* type

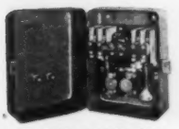
Thermal Overload Relay

Put a MONITOR Starter on that motor and be assured of 100 per cent protection with long trouble-free service

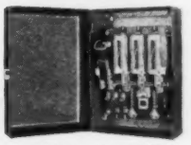


Close-up view of 5 H.P. 220-Volt, Type 6333 KF1

Pressed Steel Enclosure

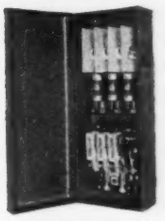


5 H.P. 220-Volt



15 H.P. 220-Volt

5 H.P. 220-Volt with Disconnect



15 H.P. 220-Volt Fusible Disconnect

Cast-iron Enclosure

Oil Immersed

THESE starters are provided with a compensated type thermal overload relay, with heater elements in each of two phases. The compensating feature is very desirable in that wide variations in room temperatures do not affect the operating characteristics of the relay; thus the same protection is provided at all times. The overload is furnished with either automatic or manual reset as required. Several forms of these starters are available, with optional modifications, which make them suitable for a wide range of industrial applications.

Standard features of design include:

(1) Compensated type Thermal overload relay, automatic or manual reset;
(2) Manual reset overload operative from reset button in cover;
(3) Start and Stop buttons in cover;
(4) Hand-off-automatic switch in cover;
(5) Fusible or unfused disconnect switch.

Enclosures are for General purpose, Dust-tight, Water-tight, Oil immersed.

Bulletin 119 describes this group of across-the-line starters in detail.

MonitorControllerCompany

MAIL COUPON FOR COMPLETE DESCRIPTION

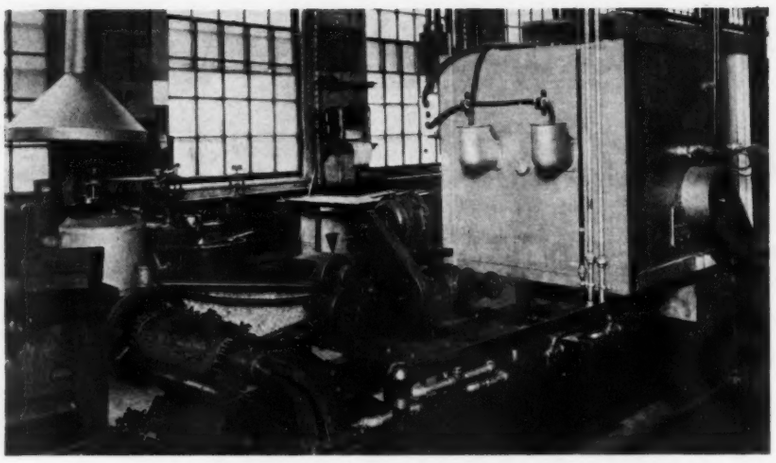
MONITOR CONTROLLER COMPANY
Gay, Lombard and Frederick Sts.,
Baltimore, Maryland.

Please send me copy of Bulletin No. 119

Name.....

Company.....

City and State.....



Variable-speed heat-treating unit facilitates production

poses and an automatic oil-quenching tank of 325 gal. capacity, shown at the left-center of the above view. The working range of the oven is from 1,450 to 1,550 deg. F., and the conveyor serving it can be operated at nine different speeds to provide a range of treatment of from 10 to 55 minutes. The steel treated normally runs from 0.45 to 0.9 per cent carbon content. The motors are equipped with Reeves speed-changing units; a closed system of oil pumping is provided.

The continuity of the production cycle from delivery into the oven to discharge into the receiving box at the end of the unit facilitates rapid handling of material. By the use of conduit wiring to the unit from the ceiling and housed-in connections at the oven top, the working space around the outfit is cleared at all times for safe and convenient service. All moving parts are guarded and the flexibility of the drive and use of two sets of heaters in the oven contribute to insure maximum output regardless of the type of material going through the unit.

•

Locating Faults in Phase Windings

By J. L. YOUNG
St. Marys, Ohio.

Partial grounds and low insulation resistance in the phase windings of a.c. motors are often difficult to locate unless deterioration, oil absorption or the presence of dirt or moisture is obvious. This difficulty is due to the fact that leakage currents and apparent grounds may not be confined to any particular coil, but may be distributed over a large section of the winding, or punctures and abrasions leading to grounds may be in coil slots or under end connections.

These faults may often be isolated by opening the star or delta connections and testing each phase winding separately with a lamp or resistance meter. When the defective phase has been located group jumpers can be opened and each group and each coil of the defective group can be tested definitely so that the fault may be located.

Ordinary insulation tests may not be justified, however, unless there is a definite indication of defects, such as operation of fuses and protective devices, extremely low insulation resistance or overheating. Cleaning, drying in an oven and the application of an insulating varnish may be sufficient to restore the insulation resistance to its proper value in the case of the absorption of moisture, dirt or oil.

Short circuits between phases are usually revealed by overheating or high-temperature spots in the windings, charred and burned insulation and unbalance of the phase currents. A phase-to-phase short circuit may be located by separating the phase-coil connections and testing with lamp or resistance meter.

A "growler" may also be used to detect defects in the windings of small motors. By placing the coil of the "growler" within the stator frame and moving it from coil to coil faults will be reflected by increased readings on an ammeter in the "growler" circuit, because of the increased current through the defective coils, due to several current paths in parallel.

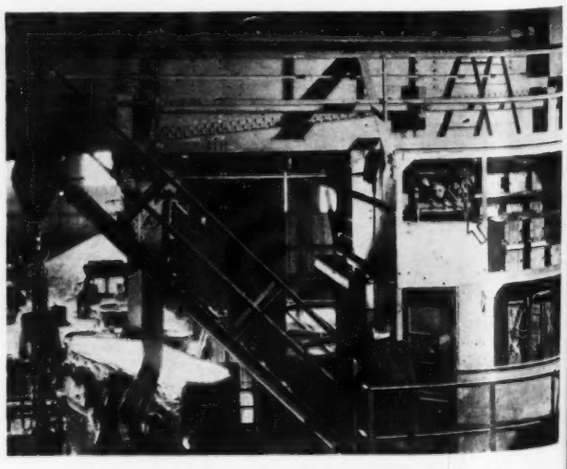
•

Conditioned Air for Hot-Metal Crane Cab

By J. W. O'NAN
Duquesne Light Company

Considerable difficulty was experienced in keeping the hot-metal crane operators from being exhausted with the terrific heat from the ladles at the A. M. Byers plant, Ambridge, Pa., especially during the summer months. To overcome this condition the cabs of two cranes which normally handle molten slag or metal were air conditioned. There was no cooling water available on the cranes for compressors or condensers and the air which could be used for this purpose was considerably more than 100 deg. F., especially during the summer.

Refrigeration units rated at $\frac{1}{3}$ ton, driven by $\frac{1}{3}$-hp. d.c. motors, were installed on top of each cab, with evaporators directly beneath the compressors. Cooled air is introduced into the cab through an outlet located in the corner of the ceiling farthest away from operator; the intake for the return air duct is mounted on the ceiling near the operator's head. The cab is insulated with 1 in. of "Celotex" covered with $\frac{1}{8}$ in. of "Transite." A metal screen on the cab window protects the operator from radiant heat.



Air conditioner installed above crane cab

Lower Cost Wiring

[*Continued from page 34*]

cealed a second heavy braid could be used or wood or metal molding could give mechanical protection as the conditions might indicate, or rigid pipe could be used where extreme exposure to mechanical damage existed.

I know many will contend this is not as safe as rigid conduit, but they will have extreme difficulty in demonstrating their contention. As regards shock, there are less possibilities than with conventional systems, especially if insulating outlet boxes are used. As regards fire, there will be less than half the amount of combustible material that there is in present systems, especially if flameproofed braid is used. The present systems with the most expensive rigid conduit and outlet boxes are not free from fire hazard if the fuses or circuit breakers fail to prevent continued excessive currents.

These objectives of low-cost appliances and adequate wiring are worth the effort of every good citizen and they hold greater possibilities for bringing to the people that much-desired "larger life" through the benefits of electricity than the lines which most of us are pursuing.

Iowa Active in Rural Electrification

[*Continued from page 41*]

2. Surveys of the probable use of electric service on each farm and the total number of farms to be included.
3. Preliminary location of lines and preliminary specifications of lines with estimates of cost.
4. Establishment of relief projects whereby relief labor may be used in making preliminary surveys, line construction or wiring of farm buildings.
5. Study of Iowa corporate laws on co-operative corporations as applied to rural electrification.
6. Preliminary determination of rates applicable to projects with review of wholesale contracts.
7. Preliminary surveys by electrical dealers or wiring contractors to determine the cost of equipment and wiring.

Thus, Iowa is quite active and definite in its endeavors to co-operate with R.E.A. and to stimulate rural electrification. It will be valuable and interesting to get the actual results of the surveys and developments as they occur. The frank statement of major costs put the projects on an open basis at the start and undoubtedly other bulletins will contain information on cost of equipment and wiring in farm buildings so that the farmer may decide whether he can afford to electrify.

Accurate INSTRUMENT TRANSFORMERS

WAGNER potential transformers have an accuracy suitable for the highest grade of meter or instrument work

Wagner instrument transformers have these advantages:

1. Within their volt-ampere rating, the ratio of transformation never varies by more than a few tenths of one per cent from their nameplate ratio.
2. Suitable for either star or delta connected circuits.
3. Require no maintenance.
4. Polarity of connections can be quickly recognized since in addition to standard markings, the polarity is designated by the color of bushings.
5. Can be easily installed in any desired position, they are of the dry type.
6. All active material is fully protected from damage and completely enclosed in strong sheet-steel case.
7. Can be easily and quickly equipped with fuses and fuse-holders.
8. Embody the latest discoveries and developments in transformer design and construction.

Wagner potential transformers are available in standard ratings, in voltage classes, 5000 volts and below.

Write for Part 4E of Bulletin 172 which fully describes Wagner potential transformers.

Wagner Electric Corporation
6400 Plymouth Avenue, Saint Louis, U.S.A.

T335-7

TRANSFORMERS - MOTORS - FANS - BRAKES

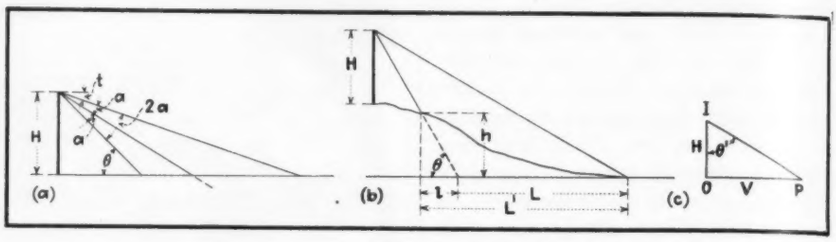
Computing Floodlight Installations

By R. J. CORFIELD
Assistant Electrical Engineer
Utah Copper Company, Garfield

Floodlighting usually resolves itself into a problem in which a certain definite area is given and a certain light intensity is required. The graphic solution of this problem is perhaps the most rapid and consists in making plan and profile to a suitable scale of the area to be lighted, and from this profile determining the angle of tilt necessary to project the toe of the beam to the proper point, which should be somewhat beyond the exact center of the area. If the area is to be lighted by a system of opposed floodlights, a 20 per cent allowance should be made for overlap of beams at the center of the area.

The beam angle is fixed, within certain limits, by the manufacturers, but there is generally a variety of lenses and lamps that may be used with any given light. The plain circular lens is probably the most popular for general lighting and throws an elliptical beam, the dimensions of which may be varied in a number of ways.

The dimensions of the ellipse are determined by the proportions of the major and minor axes, which may be calculated by substituting proper values in the following formulas:



Diagrammatic analysis of floodlighting

(a) Dimensions determined for elliptical illuminated area. (b) Method of handling slopes. (c) Components of vertical and horizontal light.

$$L = \frac{H \text{ Sin } 2a}{\text{Sin } t \text{ Sin } \theta} \qquad [1]$$

$$W = 2H \text{ Sin } a \sqrt{\frac{1}{\text{Sin } t \text{ Sin } \theta}} \qquad [2]$$

the area being

$$A = (0.7854 LW) \qquad [3]$$

for H, a, $2a$, t and θ

(See a in the accompanying illustration.)

For any given beam divergence $2a$ and angle of tilt t, it is evident that L and W will vary directly with the mounting height.

Where the area is not in a horizontal plane (b) some compensation must be made for effective beam length. The effective beam length will be equal to $L + \frac{h}{\tan \theta}$ in cases where the slope is away from the tower, and the effective beam length will be correspondingly shortened if the slope is toward the tower.

Assuming that the proper floodlight has been selected, the next step will be the calculation of the intensity and the selection of the proper lamp to give this intensity. In general, average intensity is all that is required and is found by dividing the beam lumens at the source by the area covered. If the intensity at definite points is required, it will be necessary to apply the fundamental laws of illumination from a point source. Referring to (c), the horizontal illumination at point P will be $Eh = I \cos^3\theta'/H^2$, the vertical illumination $Ev = I \text{ Sin}^3\theta'/V^2$. Normal illumination in the direction of beam $En = I\text{Sin}^2\theta'/H^2$, where I equals the light intensity and other values are as shown.

In general, for outdoor areas, moderate intensities can be used as general illumination is all that is required; however, the questions of glare and shadows are important. To avoid excessive glare it is necessary to go to high supporting structures. Complete elimination of shadows may require the use of supplementary lights, but in the majority of cases visors on the units will deflect enough light.

Any design of supporting structure is generally satisfactory up to 40 ft., beyond which point special consideration should be given to safety features. Steel structures are made for the specific purpose of mounting floodlight units and are properly equipped with necessary conveniences and safeguards, and are generally cheaper than any other type of structure.

Ellipse Dimensions for Standard Floodlights

Length and width based on mounting height of 100 ft. and tilt angles up to 12 deg. Intervening situations by proportion and interpolation

	8° Beam		10° Beam		12° Beam		17° Beam		24° Beam		32° Beam		45° Beam	
$t°$	L	W	L	W	L	W	L	W	L	W	L	W	L	W
1	5,100	267	5,200	302	5,290	324	5,410	402	5,500	485	5,560	565	5,620	683
2	2,300	179	2,400	295	2,460	228	2,580	284	2,660	344	2,710	394	2,770	479
3	1,390	140	1,478	161	1,535	183	1,630	221	1,790	270	1,770	318	1,820	388
4	960	116	1,028	134	1,080	151	1,170	187	1,240	230	1,290	272	1,340	334
5	710	100	771	116	815	131	894	163	961	202	1,010	240	1,060	296
6	550	88	604	103	645	116	715	146	778	182	823	217	871	268
7	441	78	488	92	524	105	640	138	647	166	690	198	736	247
8	362	71	404	84	436	96	496	122	550	153	592	184	636	230
9	304	65	342	77	370	88	426	113	477	142	515	172	559	215
10	258	60	293	71	320	82	371	105	419	133	455	162	497	203
11	224	56	254	67	278	76	326	99	372	126	406	153	447	192
12	195	52	223	62	245	72	290	93	332	119	367	145	406	183

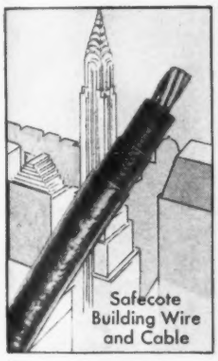
•

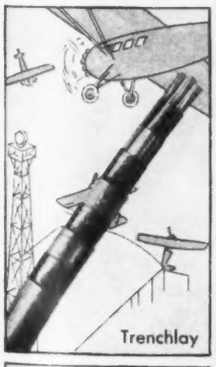
Prospectors Abandon Telephone Lines

One of the large oil companies in Texas has discovered a unique use for magnet wire. The geophysical department handles very high explosives in its field work and it is imperative that each individual keep in constant communication with his base. Each man as he starts out from the base simply straps a 5-lb. spool of No. 24 single cotton-enameled bonded magnet wire on his back so that it unwinds as

Type H Cable

Service Entrance Cable


Safecote Building Wire and Cable


Trenchlay

Varnished Cambric Cable

To the Problems of

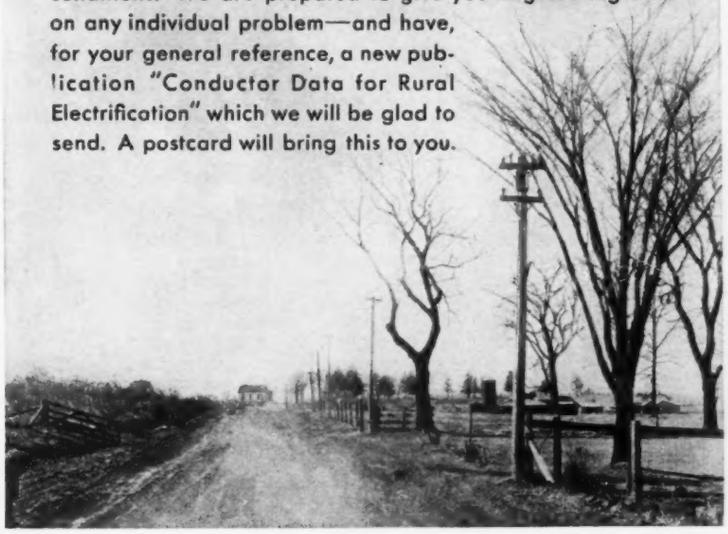
RURAL ELECTRIFICATION

General Cable brings the same complete service in approved type wires and cables as have made it a first line source of supply for all utility purchasing:

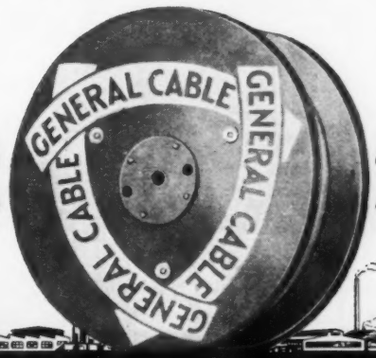
COPPER
COPPERWELD
BRONZE
CONDUCTORS

COMPOSITE CONSTRUCTIONS OF COPPER-COPPERWELD COPPER-BRONZE

The choice of conductor will be governed by the electrical and physical characteristics required to meet specific local conditions. We are prepared to give you engineering data on any individual problem—and have, for your general reference, a new publication "Conductor Data for Rural Electrification" which we will be glad to send. A postcard will bring this to you.



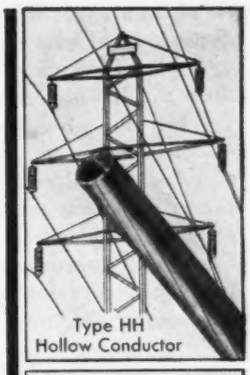
A STANDARD OF QUALITY

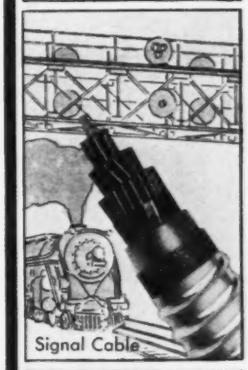


FOR OVER HALF A CENTURY

GENERAL CABLE CORPORATION

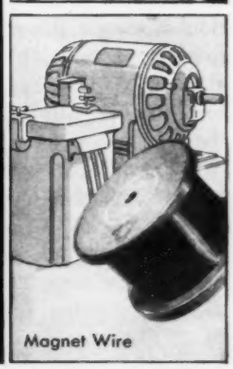
Executive Offices: 420 LEXINGTON AVE., NEW YORK


Type HH Hollow Conductor


Signal Cable

Oil-Filled Submarine Cable

Super Service Cord


Magnet Wire

Sales Offices: ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROME • SAN FRANCISCO • ST. LOUIS • SEATTLE • WASHINGTON, D.C.

he walks along. When he reaches his destination he cuts the wire, fastens it to his hand telephone and is in immediate touch with his base.

When the job is finished each man disconnects his telephone and leaves the wire. Total cost of the communication system is negligible. The oil company has purchased more than 5,000 lb., approximately 600 miles, of magnet wire for such application, the General Electric Company reports.

•

Photo-Electric Cell Protects City Water

By W. W. HURLBUT
Engineer of Water Works
Los Angeles Department of
Water and Power

In the chlorine treatment of domestic water sufficient sterilizer is added to leave a certain amount of the free chemical after complete sterilization has taken place. Heretofore the amount of uncombined chlorine has been determined by taking samples from the pipe line at a sufficient distance below the point of application to afford time for complete combination of the sterilizer with any contaminating matter. This simple test consists of adding a few drops of ortholodine solution and comparing the resulting color of the sample with calibrated color standards. After the visual determination, the dosage rate is adjusted to bring the amount of residual free chlorine to the desired value.

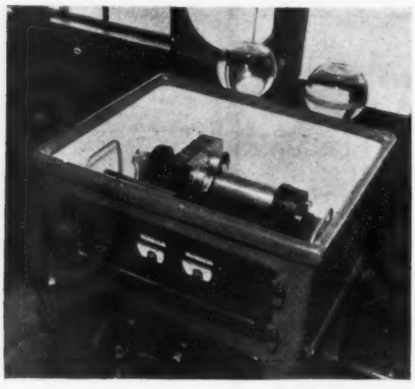
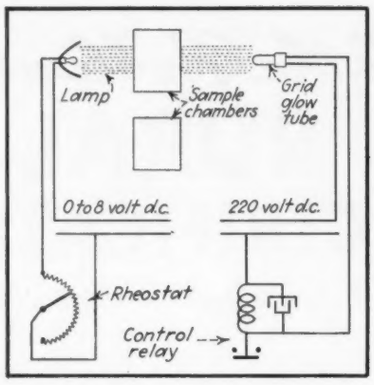


Photo-cell control mechanism automatically adjusts chlorine treatment of Los Angeles water supply

Sampling chamber has the treated water and the light measuring equipment to test the chlorination.

The foregoing procedure has been open to the objection that frequent tests were required to prevent an inadequate dosage rate, with consequent danger of delivering a contaminated supply, or too great an application, with resulting waste of the sterilizer. It has been found, however, that the photo-electric tube could be utilized automatically to compare the samples and a machine, incorporating photo-electric tube control, was devised automatically to adjust the application of the sterilizing agent.



Schematic diagram of sample comparison mechanism

In this machine a continuous sample of water is withdrawn from the pipe line at the application point and transmitted to the machine. This sample is divided into two parts and each half is placed in a glass-sided chamber. To one half the indicator is added automatically as it enters the glass-sided chamber. The other sample is left untreated, but is led into a chamber with glass sides of the required color.

A beam from a small lamp is transmitted alternately through the chamber containing the treated sample and through the chamber with the colored glass sides containing the untreated sample. This beam of light, after passing through the sample chambers, is focused upon a tube of the photo-glow type. At the beginning of each comparison operation the light is of a low intensity, but is gradually and uniformly increased by means of a small power-driven rheostat in series with the lamp until a discharge through the tube takes place.

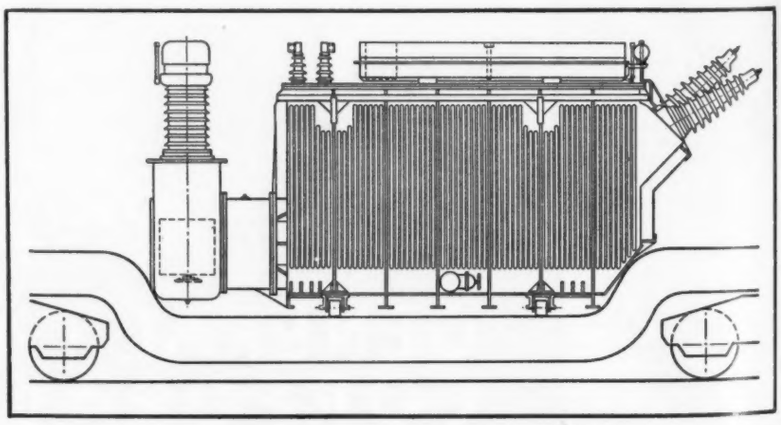
The difference betwen the time periods required by the two halves of the samples for the transmission of sufficient light energy to cause a discharge to take place through the tube is the controlling factor which initiates a cycle of operations resulting in automatic adjustment of the dosage to the amount which is required to afford the desired amount of free chlorine at the test point.

•

TransformerDesigned for Unit Shipment

Record shipment was recently accomplished by the Berlin Siemens works in that a 15,000-kva., three-phase power transformer, equipped with load ratio control equipment in its 104-kv. winding, was shipped complete, with all bushings, conservator and other accessories in place. After unloading at destination, it was thus possible to connect the unit immediately to the lines. This fact may be of great value in remote installations, where no adequate lifting devices are available and where any handling of oil may be found a hardship.

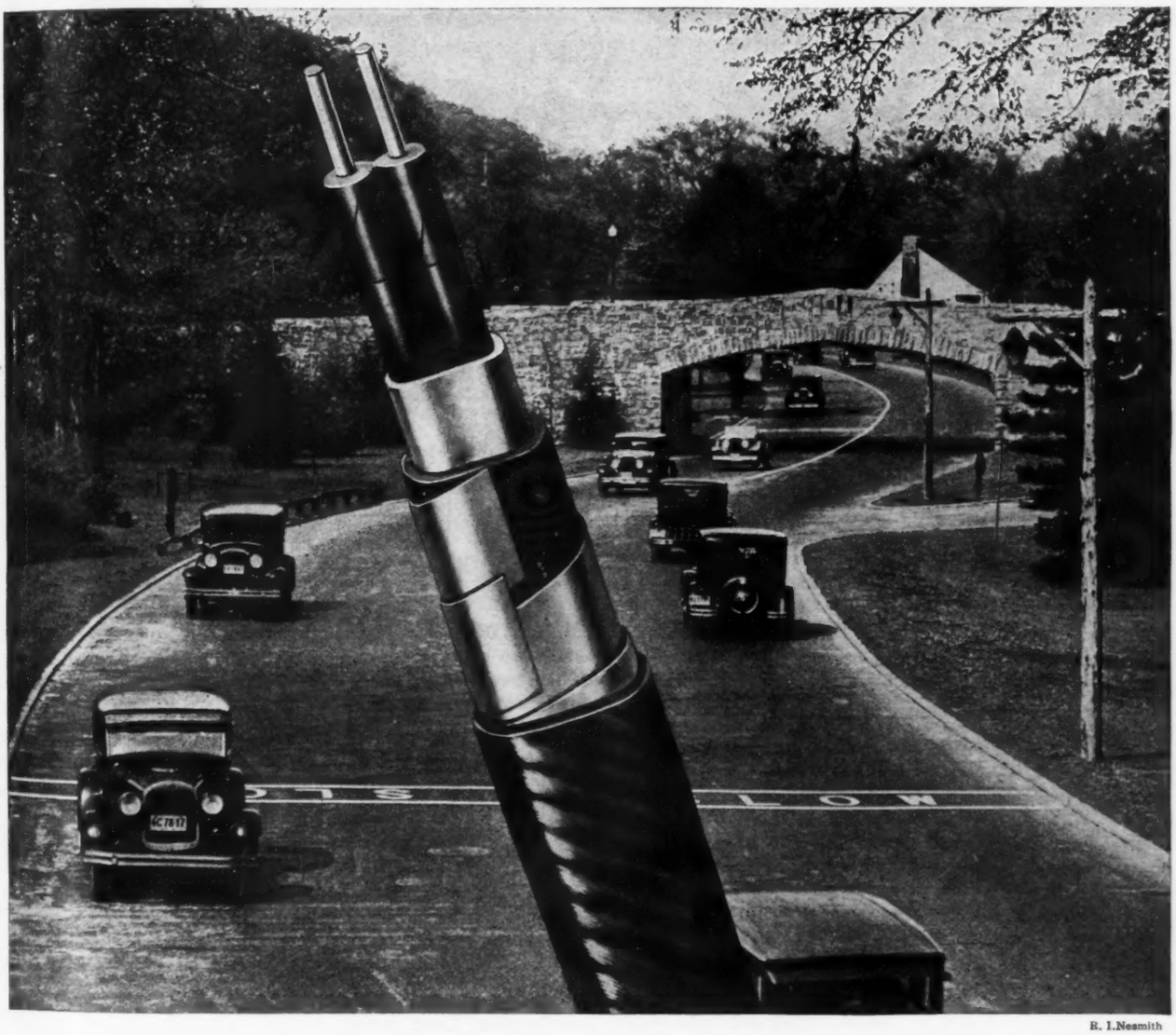
European railway clearances are materially smaller than American standards, for which reason this construction and shipment is rather remarkable. Furthermore, the announcement is made (*Siemens Zeitschrift*, April, 1935) that similar transformers of up to 30,000 kva. are now available for complete shipment, ready for operation on arrival.



Fully assembled shipment of 15,000-kva. transformer

High-voltage leads brought out inclined through narrow side of tubular tank. Conservator made long and small in diameter. Load ratio control switch placed in small tank, joined with throat near bottom to main tank. Switching contactor mounted on top of a 104-kv. lead, standing on the switch tank.

ROEBLING
PARKWAY CABLE



R. I. Nesmith

UNSIGHTLY overhead construction and the expense of conduits and manholes are eliminated through the use of Roebling Parkway Cable. It is ideally adapted for street and parkway lighting, railway signal, telephone, telegraph, and short power transmission circuits.

Available in single and multiple conductor, solid or stranded. Furnished with or without lead sheathing under the armor, with or without metal tapes, and with a variety of insulations.

Over 60 other Types of Roebling Electric Wire and Cable are available to meet practically every need. We invite your inquiry.

JOHN A. ROEBLING'S SONS CO., TRENTON, N.J.
Branches in Principal Cities

ONLY A FINE PRODUCT MAY BEAR THE NAME ROEBLING JAR

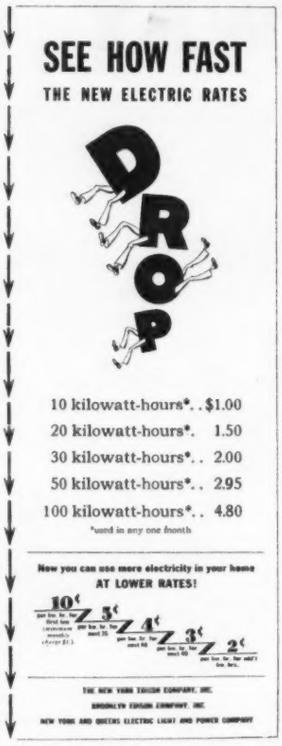
Building Farm Load in the Northwest

By D. B. LEONARD
Agricultural Agent
Pacific Power & Light Company,
Walla Walla, Wash.

For the past several years the Pacific Power & Light Company has been carrying on a definite load-building program. The work is done by thirteen rural representatives under the supervision of an agricultural agent. Several of the rural representatives work in other departments for a portion of each month. We find that a full-time rural representative can take care of 1,000 farms.

We serve 8,750 farm customers. It is our plan to contact all of them at least once a year, and to make about as many special calls adding equipment. A full-time rural representative will make approximately 200 farm visits in a month, and from 120 to 150 of these calls will be first calls, the remainder being return calls to take care of inquiries.

Compensation for full-time representatives varies from $125 to $165, the salary being supplemented with a "farm load-building bonus," which is designed to create interest in the addition of certain specific load-building devices. It applies to motors, sterilizers, hotbeds, brooders and other similar pieces of equipment which we wish to feature especially in securing additional load.



The NEW YORK UTILITIES made good use of the stair-step simile in introducing their new promotional rates—in many ads showing a girl stepping down the zigzag

In making contacts with our customers we first see that adequate service is available. Our rural representatives are without obligation as far as sales effort is concerned and are in a position to analyze the billing or to discuss various types of equipment that may be used to the advantage of the farmer. A card record is kept of the equipment in service on every farm and notations are made of additional equipment that the customer may desire or need. From these records prospect files are prepared, classifying the customers as prospects, for various types of equipment. In certain cases these prospect files are submitted to dealers. They are used as lists for direct mail advertising, which includes a monthly farm news letter that goes to approximately 1,000 selected farm customers.

In our "Running Water" campaign we held organization meetings with dealers to stimulate their efforts in water system sales. We compiled prospect lists of 3,000 prospects. To each we sent a direct mail broadside on running water, which was supplemented by a number of direct mail pieces sent by individual pump manufacturers. In 1934 our rural representatives called on 7,200 separate farm customers and secured the installation of 778 units of farm load-building devices, which produced an additional estimated annual revenue for the year of $17,601.27, an average of $2.02 for each one of the farm customers.

This additional equipment consisted of the units shown in the accompanying table. Water systems and brooders bulked largest.

Farm Load Sold in Oregon Last Year

Units	Equipment	Hp.	Kw.-Hr.	E.A.R.	Units	Equipment	Hp.	Kw.-Hr.	E.A.R.
52	Farm motors	89¼	18,186	$545.60	122	Brooders	...	36,600	$1,098.00
66	Irrigation pumps	174	430,400	5,595.20	26	Incubators	...	7,580	227.40
36	Stationary sprayers	198	49,500	1,980.00	3	Poultry water warmers	...	300	9.00
17	Apple graders	17½	5,977	179.31	1	Poultry mash warmer	...	1,260	8.82
1	Potato grader	¾	262	7.86	10	Hotbeds	...	1,620	48.60
33	Apple washers	80 11/12	28,339	850.17	48	Farm yard lights	...	960	48.00
240	Water systems	79½	72,000	2,877.00	13	Poultry house lights	...	1,600	48.00
25	Milking machines	14½	18,750	562.50	2	Poultry scalders	...	15,200	113.00
11	Dairy sterilizers	...	66,000	594.00	25	Hop drying fans	133	46,550	1,396.50
3	Milkhouse water heaters	...	14,760	103.32	6	Hop elevators	8½	425	12.75
15	Dairy cold rooms	14½	50,749	608.99	2	Fruit refrigerators	30	41,667	625.00
1	Churn	½	75	2.25	—				
20	Cream separators	4 11/12	2,000	60.00	778		845 5/12	910,760	$17,601.27

178% INCREASE IN KW CONNECTED

During the first six months of 1935 Edison's "Deal Me In" Plan increased the KW connected for utility customers 178%. Heavy Duty specialists working with power company commercial men sold electric fry kettles, bake ovens, grills and kitchen equipment to restaurants, hotels, bakeries, soda fountains, bars and other "Main Street" concerns in the business of dispensing food. The following power company survey gives you a quick picture of the results of this aggressive sales activity:

Device	Average Annual KW Hr per KW Connected	Average Annual Revenue per KW Connected	Average KW Connected per Device	Average Annual Revenue per Device
Broilers	1800	$45.00	5.5	$247.50
Bake and Roast Ovens	1500	37.50	5.1	191.25
Fry Kettles	1500	37.50	2.9	108.75
Grills and Griddles	3600	90.00	1.5	145.00
Average	2100	$52.50	3.75	$173.12

FOOTBALL PLAN FOR FALL

Now Edison announces a new Fall campaign that is predicted will get even better results for our power customers.

This activity, the Football Plan, is fully outlined in a new book entitled "Touchdown Team." It describes the sales contest and contains samples of new literature and sales promotion material.

The Edison specialist in your territory is ready to give you the whole story at your convenience. Write today for full details.

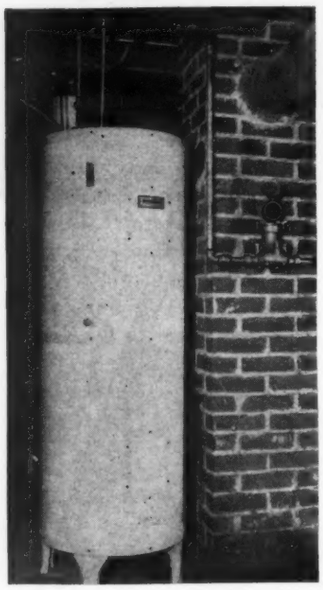
EDISON

EDISON GENERAL ELECTRIC APPLIANCE CO., Inc. • 5618 West Taylor Street, Chicago, Illinois

World's Oldest and Largest Makers of Electrical Cooking Equipment

Metering Hot Water Sales in Vermont

For considerably over a year the Green Mountain Power Corporation of Burlington, Vt., has been selling electric water heating on a water-meter basis. The rate for electric heating is arranged to provide for supplying sufficient energy to heat 400 gal. of water to 140 deg. F. for $2.50 per month, with an additional charge of 1 cent for each 4 gal. above the 400. Thus far the sale of the heaters has been limited to electric range customers where existing transformer and service capacity required no enlargement to take care of the electric water-heating load. The company reserves the right to require off-peak operation, but thus far this has not been necessary. Three makes of electric water heaters have been approved for this service.



Domestic water heater equipped with water meter for boiling service

The capacity of tanks installed ranges from 20 to 50 gal., but about half the installations are 30-gal. and the other half of 50-gal. capacity. Heaters are sold to the public by advertising and solicitation and are priced installed, monthly payments being provided on a company-financing basis. The company uses a special water meter with a vertical dial and hot water impeller, the meter being installed in the cold water line leading to the tank. It registers U. S. gallons and is designed so that if hot water should back up through the meter no damage would occur. About 50 electric installations have been made and check tests indicated in a preliminary way that the company was heating between 3.2 and 4.2 gal. per kilowatt-hour consumed. The average annual gross return per customer having this service is about $50. In the past year not a single complaint of high bills or of poor service was received by the Green Mountain Company.

Buffalo Contest Places Mixer First

With 55,000 contest blanks distributed by 225 co-operating dealers, the Electrical League of the Niagara Frontier recently interested 2,400 Buffalo people in marking the best location of 30 electrical appliances on a house plan. It also produced 2,766 prospects for specific appliances in the following order of their local popularity: Kitchen mixer, 513; refrigerator, 465; vacuum cleaner, 437; all-wave radio, 419; clothes washer, 375; ironing machine, 356; electric range, 197.

The contest blank carried the phantom view of a one-story home, surrounded by pictures of the appliances. The contestant drew a line for each appliance to a waiting outlet on the plan. In the process, thousands visited dealers' stores to see the appliances and discuss their use.

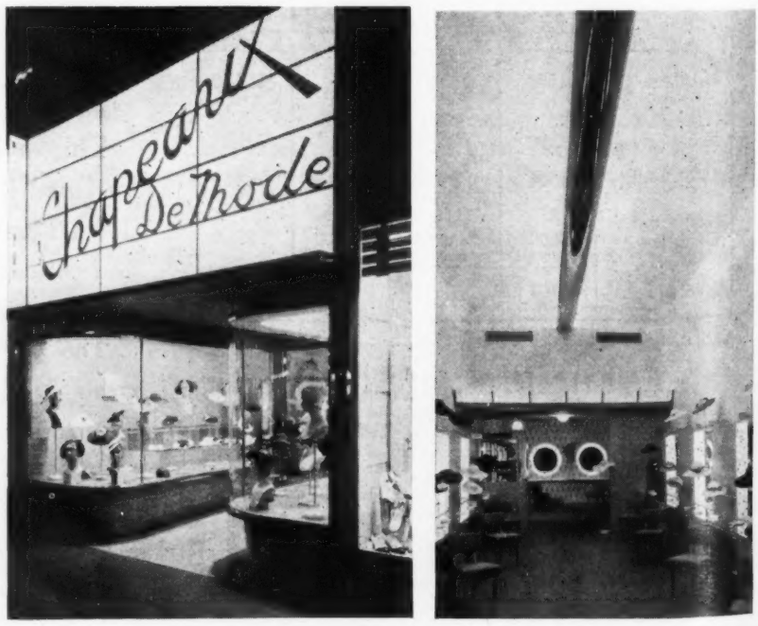
Light Sells Hats in Hollywood

By T. H. SHEPHERD
Illumination Engineer
Los Angeles Bureau of Power and Light

Light is the decorative feature of a millinery shop in Hollywood—the Chapeau de Mode—and has made it outstanding in sales appeal. Chromium-plated letters boldly silhouetted against an opal glass background, illuminated by 26 100-watt lamps, make a distinctive store front, with high-intensity lighting in the windows using prismatic lenses in porcelain reflectors.

On its interior general illumination is provided by a central indirect luminaire made up in a trough design, chromium-plated on the outside, running the length of the shop. In its interior are 34 100-watt lamps, the light diffused by the porcelain reflecting surface of the trough to give an even, pleasing intensity of light of 40 foot-candles in the store. It is a striking bit of modernistic ornamentation with a high efficiency.

More important still is the illumination of the fitting mirrors, by special indirect white reflectors, located directly in back of the mirrors and projecting out and around the sides. The reflecting surface is corrugated perpendicularly to give the effect of small pilasters of light at each side of the mirrors, and splendid results are obtained without using diffusing glass.



High-intensity lighting enhances architecture of smart Hollywood shop and is a powerful advertising influence

The sign and window beckon from afar and customers see the hats more easily and buy

MEN OF THE INDUSTRY

Pennsylvania Association Elects A. J. Althouse Head

Adam J. Althouse, assistant general manager of the Metropolitan Edison Company, was elected president of the Pennsylvania Electric Association at the annual convention held last week at Bedford Springs, Pa. Devoting his entire business life to the construction and operation of electric light and power properties, Mr. Althouse has literally "grown up" with the industry. And just as steadfast as he has been in his devotion to the one industry with which he has been affiliated for twenty-nine years, so earnest has he been in participating in the affairs of the Pennsylvania Electric Association, of which he has been a member for twenty-five years.

A. J. Althouse

His early training started in 1906, when he was superintendent of construction for small electric light and power companies which were being built at that time. In 1908 he became superintendent of the Birdsboro (Pa.) Electric Company and three years later he moved to Hamburg, Pa., where he was in charge of the construction of a new power plant for the Hamburg Gas & Electric Company. The work also included the reconstruction of the company's distribution system. With this completed, Mr. Althouse was appointed superintendent in charge of operations. In 1921 the Hamburg Company acquired control of the Topton Electric Light & Power Company and Mr. Althouse became general superintendent of both the Hamburg and Topton companies, serving in this capacity until 1924, when he was transferred to Reading. This transfer occurred when the two smaller companies were acquired by Metropolitan Edison Company of Reading.

In his new location Mr. Althouse served until March, 1929, as a special representative for the company and was then appointed assistant general manager, in which capacity he has continued to date. Mr. Althouse is past-chairman of the Lehigh Valley section of the American Institute of Electrical Engineers.

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▶ ANDREW W. CRUSE, chief of the electrical division, Bureau of Foreign and Domestic Commerce, Washington, D. C., has recently returned from a trip to England, France and Germany.

▶ DONALD G. EVANS has been appointed assistant general manager of the Wisconsin Gas & Electric Company, Racine. Mr. Evans entered the service of the Racine utility in 1919.

▶ FLOYD L. CARLISLE, chairman of the boards of the Consolidated Gas Company and the Niagara Hudson Power Corporation, returned last week on the liner *Berengaria* of the Cunard White Star Line after a month's vacation in Europe.

▶ FRANK R. MCNINCH, chairman of the Federal Power Commission, returned from Europe last week on the United States liner *Manhattan*.

▶ EDGAR S. NETHERCUTT has been elected secretary emeritus of the Western Society of Engineers as of September 1 after serving that association for eighteen years. He is succeeded as secretary and director by LEIGH S. KEITH. Following graduation from the University of Wisconsin in 1889, Mr. Nethercutt obtained extensive engineering practice with Wade & Purdy, the Bullock Printing Press Company, the Paige Iron Works and Buda Company. For ten years beginning in 1907 he was engaged in consulting work in Chicago, New York and Washington, D. C. It was in 1917 that he became identified with the Western Society of Engineers. Mr. Keith is a prominent consulting electrical engineer with offices in Chicago. He was graduated from Massachusetts Institute of Technology in 1900 and entered the employ of the New York Telephone Company. In 1909 he joined the consulting firm of McMeen & Miller, becoming in time managing engineer and partner. For two years after the war he was associated with J. G. Wray & Company as special engineer and in 1922 he opened his own office in Chicago as consultant on public utility and industrial problems. Mr. Keith was treasurer of the Western Society of Engineers from 1928 to 1932 and vice-president for the three succeeding years.

C. W. Koiner Consultant for P.W.A. Power Division

C. Wellington Koiner, city manager of Pasadena, Calif., has been appointed by Secretary Ickes as consulting engineer for P.W.A.'s new power division.

Born in Virginia in 1870, Mr. Koiner has managed private utility plants in Oneida, N. Y.; St. Louis, Mo.; Wichita, Kan.; Fort Worth, and Waco, Tex. In 1907 he went to Los Angeles as general superintendent of the Los Angeles Gas & Electric Company and in the following year was engaged by Pasadena to build and manage its municipal electric plant. During the war he served as power expert for the U. S. Shipping Board. In 1921 he became city manager of Pasadena, serving until 1925 and again from December 1, 1933, until the present time. From 1925 to 1927 he was engaged in private practice as a consulting expert on electric rates and valuations. In 1927 he became district manager of the South Bay territory, Southern California Edison Company.

C. W. Koiner — *Harris & Ewing*

Mr. Koiner is a fellow of the A.I.E.E. and past-president of the International City Managers Association.

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▶ CLARENCE WATSON, formerly middle Tennessee district manager for the Tennessee Electric Power Company, has been appointed Cumberland district manager to succeed L. C. Parks, who recently became vice-president and general manager of the Gulf Power Company at Pensacola, Fla. Mr. Watson has been actively associated with the electric light and power industry in various branches of the business in middle Tennessee for the past fifteen years. In 1920 he entered the employ of the Southern Cities Power Company as superintendent of construction. Two years later he was made division super-

intendent, with headquarters at Columbia, and in 1924 he became general superintendent, with headquarters in Columbia and Shelbyville. He continued in that capacity until 1929, when the Southern Cities Power Company was acquired by the Tennessee Electric Power Company.

▶ L. O. RASMUSSEN, formerly general superintendent of the Union Light, Heat & Power Company, Fargo, N. D., has been appointed general superintendent of the properties of the Interstate Power Company in Galena, Ill. He succeeds the late J. D. Walter.

▶ STERLING BECKWITH, formerly connected with the Metropolitan Water District of Southern California, Los Angeles, is now engaged in alternating-current machine design in the electrical department of the Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

▶ T. I. PHILLIPS has been appointed general works manager of the Westinghouse Electric & Manufacturing Company. In his new position he will serve as central authority for all manufacturing operations of the company. Mr. Phillips has been with Westinghouse since 1915.

▶ DR. DUGALD C. JACKSON, professor emeritus and honorary lecturer in electrical engineering, Massachusetts Institute of Technology, and past-president of the A.I.E.E., will leave the United States early in October to deliver a course of lectures in Japan under the Iwadare Foundation. The subjects to be covered are: The intimate co-operation in America between technical industry and technical education; products and processes in American industry derived from university laboratories, and influences of exact standards and accurate methods of measurement upon industrial development. Previous Iwadare Foundation lecturers from this country have been Dr. A. E. Kennelly, C. E. Skinner and Dr. Irving Langmuir.

▶ W. J. CANADA, for many years prominent in electrical circles, has entered upon a new activity, as special engineering representative for certain electrical manufacturers. The companies represented at this time are the Chase-Shawmut Company, Newburyport, Mass., and the Wiremold Company, Hartford, Conn. Mr. Canada maintains offices in New York. Mr. Canada devoted special attention to safety work, in the course of his career having been identified with the National Fire Protection Association, the Rocky Mountain Fire Underwriters' Association and the Bureau of Standards, where he made a special study of electrical life hazard. He also was head of the engineering department of the National Electric Light Association at one time and was affiliated with the National Electrical Manufacturers' Association. At the present time he is an associate member of the International Association of Electrical Inspectors.

▶ H. A. CAMPBELL, last of Thomas A. Edison's co-workers to retire from active duty in the New York Edison Company, relinquished his duties on July 31 to spend his time henecforth on his farm on the outskirts of Metuchen, N. J. Mr. Campbell is 82 years old and until his retirement served as superintendent of the second district in charge of fourteen substations in that part of Manhattan extending from Eighth to Fiftieth Street. Mr. Campbell became associated with Mr. Edison at Menlo Park in 1878, one year before the perfection of the incandescent lamp. He built the apparatus used at the Menlo Park exhibition of Edison's lamp in 1880. In 1881 he was brought to New York City as contractor in charge of all construction relating to the building and installation of equipment in the Pearl Street station, which went into operation in 1882. At a dinner given in his honor Mr. Campbell talked at some length about his early association with Mr. Edison.

OBITUARY

▶ RICHARD H. BROWN, formerly president of the Manhattan Electrical Supply Company, died suddenly September 3 at his home in New York.

▶ ADDIS M. WHITNEY, formerly treasurer of the Massachusetts Lighting Companies of Boston and for many years well known in New England utility circles, died at his home in Swampscott, Mass., August 27. Mr. Whitney retired from business about twenty years ago. He was 73 years of age.

▶ CHARLES R. PRATT, consulting engineer, who is credited with designing and building the first electric elevator, died September 3 at his home in Montclair, N. J., after a year's illness. He was 75 years of age. It was while connected with the Whittier Machine Company of Boston in 1888 that Mr. Pratt designed the first electric elevator. Three years later, while associated with the late Frank J. Sprague, he designed and built an electric elevator which was installed in the Grand Hotel, New York City. Several years later the Otis Elevator Company, manufacturer of hydraulic elevators, bought out the electric elevator business of the Sprague company. As a consulting engineer in more recent years Mr. Pratt obtained a score of patents on elevator safety devices, hydraulic transmission for motor vehicles and machine tool devices. During the World War he was mechanical superintendent of the Crocker Wheeler Company in Ampere, N. J., and until his retirement four years ago he was associated with the Watson Elevator Company, New York, in the development of a duplex-drive type of elevator of his own invention.

▶ LOUIS TEVELL, secretary of the Public Service Commission of Pennsylvania since 1931, died August 14. Mr. Tevell was 40 years of age and had spent seventeen years with the commission.

▶ AUSTIN Y. TUEL, vice-president and general manager of the Mackay Radio & Telegraph Company, who had been closely associated with radio telegraphy since its early days, died suddenly in New York August 27 at the age of 53.

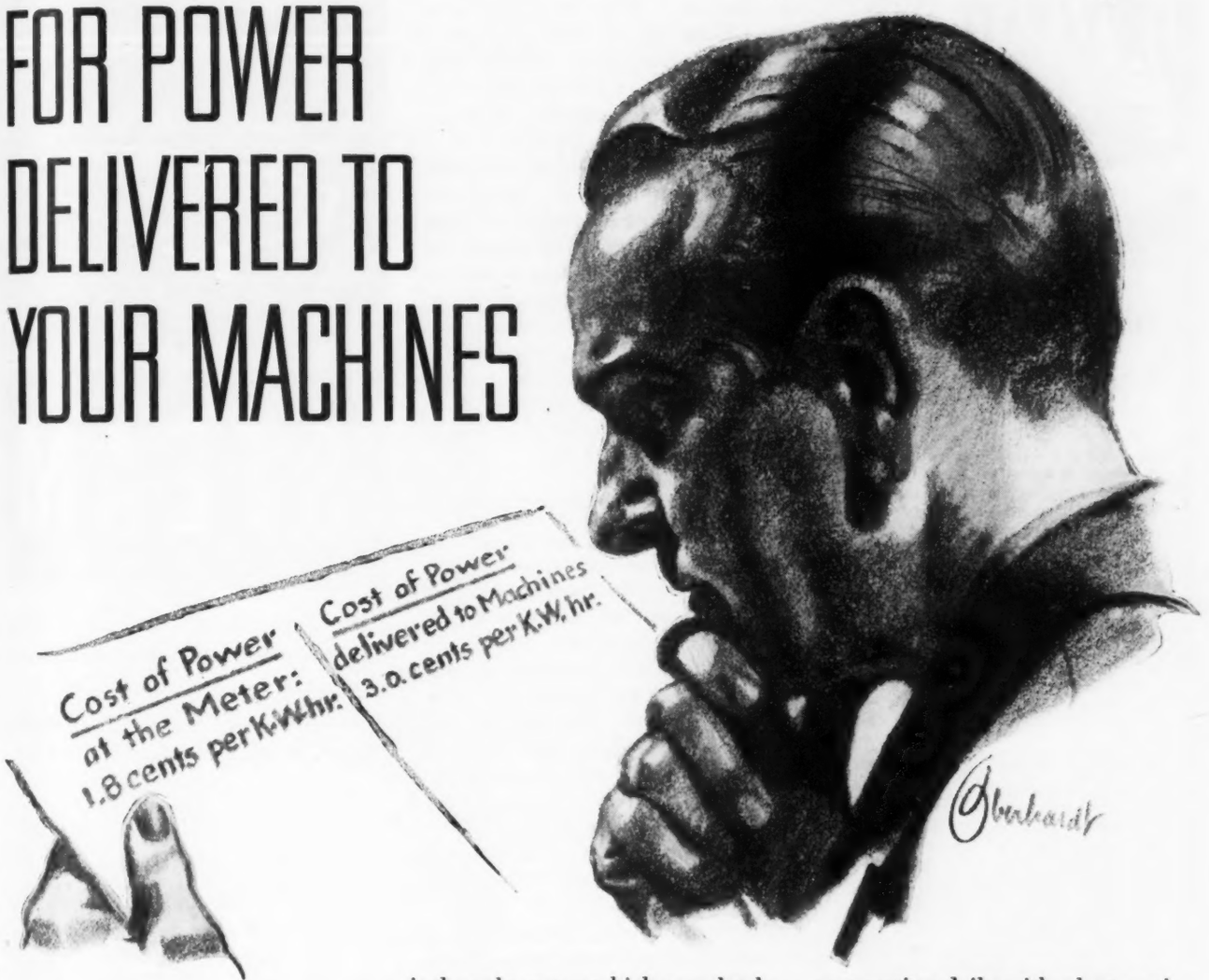
▶ CLARENCE L. KIRK, prominently identified with the public utility industry in Indiana, died August 23 at his home in Indianapolis, after a year's illness. He was 69 years of age. At the time of his death Mr. Kirk was vice-president and general manager of the Citizens Gas Company. A native of Burlington, Ky., he established residence in Indianapolis in 1913, after holding a number of Indiana utility positions, including that of vice-president and general manager of the East Chicago and Indiana Harbor Water & Electric Light Company.

▶ ROSCOE W. COST, transportation lighting engineer for the Westinghouse Lamp Company at Bloomfield, N. J., and pioneer in airport and airway lighting work, died September 3 at East Orange, after a long illness. Mr. Cost played an important part in the project of designing the floodlight system for the Newark Airport. Many of the tungsten filament lamps of 1,000 to 5,000 watts now used to light airports and routes are credited to his work. He joined the Westinghouse company in 1927. He was a member of the Illuminating Engineering Society and of other technical associations. Mr. Cost was 42 years old.

▶ HARRY E. STITT, chief engineer of the Austin Company, Cleveland, Ohio, until recently, when he became consulting engineer after illness forced him to reduce business responsibilities, died in that city August 23. Mr. Stitt is accredited with having originated the principle of standardized unit construction for modern industrial buildings. He applied this idea in hundreds of plants erected by the Austin Company between 1914 and 1935, under his engineering direction. During this period he also pioneered in the application of welding to industrial construction and was largely instrumental in establishing a widespread preference for welded structures. Mr. Stitt was 58 years of age.

How much Too Much *are you paying*

FOR POWER DELIVERED TO YOUR MACHINES



That question you *must* answer. Yet, until you have worked out an analysis of your present costs, you cannot know how much you can save by using *the most economical power transmission system.*

There are just two modern power transmission systems in the industrial plant. One involves high investment costs and high operating and maintenance expense—putting a motor on every machine. Conditions may warrant this system in spite of extra cost, for it is usually more efficient than old-fashioned line-shaft drive.

BUT, wherever production may be arranged to group a number of machines around single larger motors, MGD (Modern Group Drive) is the only system which completely fits today's economic picture. MGD utilizes the diversity of power requirements of numerous machines to reduce the total power supplied and to use that power more efficiently; it is the most economical system to install, and the least costly to maintain.

If lowest cost can be obtained with present equipment, modernize your power transmission with MGD. If you can further reduce your manufacturing costs with new machines, cut capital and operating costs to the limit with MGD. The extra saving often makes it possible to buy now. And MGD meets F.H.A. loan requirements.

At your service are 3500 Power Transmission Counselors, who are cooperating daily with plant engineers, consulting engineers and public utility engineers in the modernization of industrial power transmission systems. Ask them to assist you, to survey without obligation your machinery drive problems. Meanwhile, send for a free copy of the famous Red Book, "A Practical Analysis of Some Fundamentals of Industrial Power Transmission". It will give you food for thought.

POWER TRANSMISSION COUNCIL
1 Atlantic Street, Stamford, Conn.

A research association of producers and distributors of power, power units and mechanical equipment for the transmission of power

MODERN PTC GROUP DRIVE

A POWER DOLLAR SAVED IS A PROFIT DOLLAR EARNED

BUG Harvests . . . twice a year

Plant lice and shellac—they are part of the electrical industry. Shellac is used in some kinds of electrical insulating varnishes and it comes from bugs which feed on the sap of trees in India! These bugs or plant lice exude a resin that finally entombs them. Before the lice die their young are transplanted to other trees. The older generation and the resin it has produced is scraped from the trees. After much refining to separate resin and insect, the product is shellac of several grades. About six months are required for one crop of shellac.

◆

Research has brought to light many curious as well as valuable facts about materials for electrical insulation. And, for 50 years, Westinghouse has maintained constant research to develop the finest possible insulation. Westinghouse insulating materials are made to keep your equipment on the job. Make your insulation dependable . . . specify Westinghouse. Send for new booklet C-2033, "Making Insulation Fit the Job." Address Westinghouse Electric & Manufacturing Co., Dept. 100, East Pittsburgh, Penna.

◆

Varnishes - Cements - Compounds - Treated and Untreated Fabrics and Papers - Micas

◆

Westinghouse

INSULATING MATERIALS

R-89006

Compensating Metering Saves

[*Continued from page 35*]

necessary only to incorporate a watt-hour-demand register with the compensating meter and add this loss increment of maximum demand to the secondary load demand. If continuous power-factor measurement is required a compensating meter can be calibrated to measure the loss increment associated with reactive kilovolt-ampere-hours.

That the meter can be set to register *line losses* as well as *transformer losses* is a distinct advantage in certain instances. This frequently permits the whole metering installation to be in a substation rather than necessitating its location at a remote point of delivery, such as, for example, a property line or a state line. It is thought that one of the most important uses will be to give an accurate registration of energy transfers across state lines.

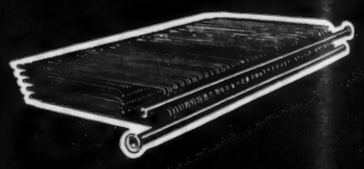
Calculations readily mastered

The compensating meter is, in its mechanical construction, virtually a polyphase watt-hour meter. In practice, therefore, the calculations required are simple and have been readily mastered by metermen capable of dealing with the corresponding primary installations. The meters themselves are interchangeable between installations, with only a change in adjustment to give a change in the calibration and in the register ratio to obtain decimal billing constants, and only standard watt-hour meter registers with standard ratios are used.

The installed cost, when added to a secondary meter installation, varies from $150 to $200, depending on local conditions. Greater installation economies than those shown in the table for new installations usually can be effected where an existing secondary customer is changed to a primary rate. The additional operating cost of a compensating meter with demand register has been approximately $5 per year. This included $2 for increased billing costs and an annual test of the meter.

Based upon construction and operating economies, simplicity of equipment, advantages to sales organization and customer satisfaction, this novel innovation in metering, thoroughly time tried under a wide range of service and customer conditions, bids fair to gain a rapidly expanding use by our industry.

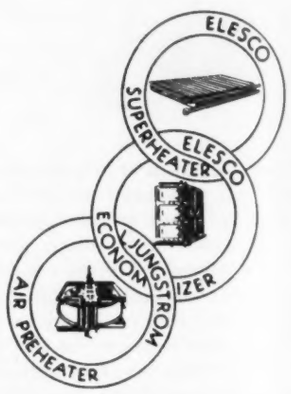
Modernized



STEAM

Elesco superheaters decrease steam consumption and raise efficiences in plants.

Elesco superheaters are a basic factor in plant modernization.



ELESCOORDINATED

THE SUPERHEATER COMPANY

THE AIR PREHEATER CORP.

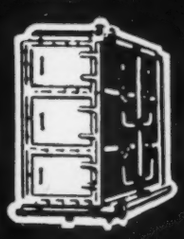
60 East 42nd St. . . New York

SUPERHEATERS · AIR PREHEA

NEW inventions and products ready to be exploited when added to the regular volume of business plus replacements and modernization are sufficient to absorb any unemployment . . .

J. L. KRAFT
President
KRAFT PHENIX CHEESE CORP.

Modernized



WATER

Elesco economizers increase evaporation per pound of fuel and therefore increase boiler capacities.

Elesco economizers are a basic factor in plant modernization.

Ljungstrom air preheaters decrease coal consumption and raise efficiencies in plants.

Ljungstrom air preheaters are a basic factor in plant modernization.

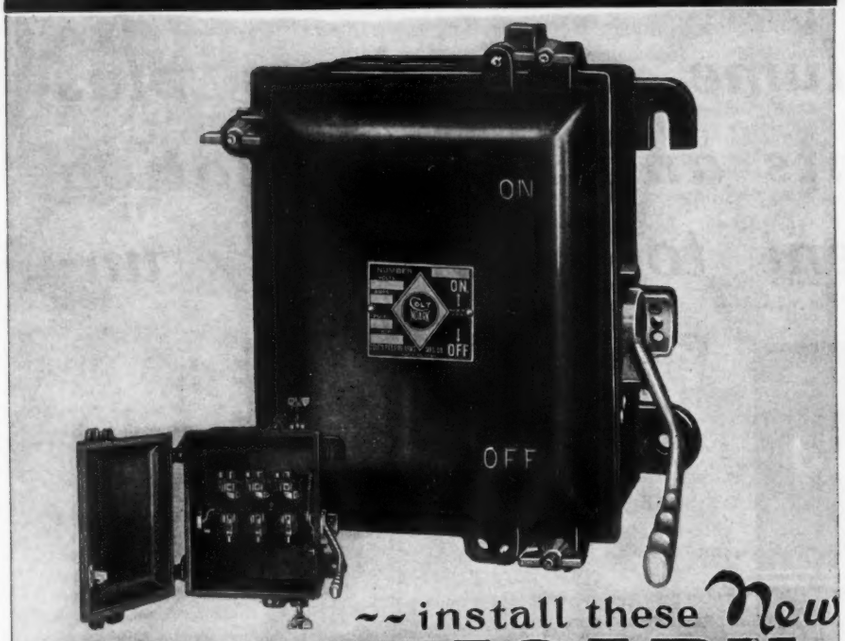
Modernized

AIR

RIFFIN HOT BLAST • WATER WALLS • ECONOMIZERS

A-958

WHEREVER LIFE FOR A SAFETY SWITCH IS *TOUGH*



~~install these *New*

COLT-NOARK

Dust Proof and Weatherproof Switches

These new Type "A" Colt-Noark Weatherproof switches are rain proof and dust tight — built to stand up under the most severe outdoor and indoor conditions — moisture, flour dust, cement and coal dust, dirt, lint and fumes. Cased in a rugged cast iron box — the safety switch within is completely sealed — a *super-safety* switching unit.

They're Brutes for Punishment

TYPE "A"
Dualbreak Switches

Type "A" 575 Volt Dualbreak Switches are now available in these new cast iron cases, equipped with quick-make and quick-break mechanism and safety cover interlock. All are full H.P. rated. 30 to 200 amperes—fusible and non-fusible. This switch mechanism is ideal for both outdoor and indoor locations — simple, dependable and rugged.

The covers of these cast iron boxes are bolted to the cases with extra heavy corrosion proof eye-bolts and wing nuts — the bolts on the left side acting as cover hinges. The operating handle is furnished with dust-tight bearing — with opening in handle and case for padlocking. A soft rubber gasket is located between the cover and the case. Tapped holes are drilled in both top and bottom for conduit — with extra holes plugged with heavy pipe plugs. Cover easily opened for inspection and replacement of fuses — and generous wiring space is provided as in all Colt-Noark switches.

. . . . . **Get This**

A special edition of the Colt-Noark catalog has just been printed. Full description of safety switches — meter service switches — motor starters. Your copy is ready.

ELECTRICAL DIVISION

COLT'S PATENT FIRE ARMS MFG. CO., HARTFORD, CONN.

Boston, New York, Chicago and Philadelphia. H. B. Squires Co., Pacific Coast Representative

COLT-NOARK

SWITCHES - MOTOR STARTERS - FUSES

SALES OPPORTUNITIES IN NEW CONSTRUCTION

SAVANNAH, GA.—Savannah Electric & Power Company plans extensions and improvements in steam-operated electric generating plant, with installation of new turbo-generator unit and accessories. Cost about $360,000.

EDGE MOOR, DEL.—Ludlow Manufacturing Associates, Ludlow, Mass., plan installation of motors, controls, regulators and other electrical equipment in new multi-unit textile mill on 10-acre tract of land recently acquired at Edge Moor, near Wilmington. Cost over $1,500,000.

FLINT, MICH.—Has plans for proposed city-owned electric light and power plant, including electrical distribution lines. Cost about $2,000,000. Financing is being arranged through Federal aid. Black & Veatch, 4706 Broadway, Kansas City, Mo., are consulting engineers.

BELLEVLLE, N. J.—Public Service Electric & Gas Corporation, Newark, N. J., has arranged with city officials at Belleville for installation of underground conduit lines on Washington Avenue, to replace present overhead system. Cost about $320,000.

DOVER, OHIO—Receives bids until September 19 for extensions and betterments in city-owned electric light and power plant, including new steam turbo unit and accessories, high-pressure boilers and auxiliary equipment, stokers, condensers, switchgear and miscellaneous equipment. Estimated cost, $330,000.

LITTLE ROCK, ARK.—Arkansas Power & Light Company has plans for installation of transmission and distribution lines in parts of Hempstead, Clark and Nevada Counties, for electrification of rural areas, including power substation and service facilities. New power line will be built from Bierne to Boughton, Dunlap and vicinity. Application has been made for permission. Cost over $100,000.

BROOKLYN, N. Y.—Signal Supply Officer, Signal Corps, Army Base, will receive bids until September 23 for 31,000 feet cable and 22 reels (Circular 21), and for 15 electrical test sets (Circular 31).

MASON CITY, IOWA—Peoples Gas & Electric Company, Mason City, plans new transmission lines from Mason City to Portland, and from Nora Springs to Rudd, Iowa, for light and power service, including power substation facilities. Application has been made for permission.

KNOXVILLE, TENN.—Director of Purchases, Tennessee Valley Authority, receives bids until September 19 for one outdoor metal-clad multiple-circuit switchgear unit for Wheeler hydro-electric power plant.

ROCKVILLE CENTER, N. Y.—Closes bids on September 25 for one 2,500-kva., a.c., oil engine-type electric generator unit with accessories, and for 40-kw. direct-connected exciter; also for one 2,900-hp. Diesel engine unit with auxiliary equipment for city-owned electric light and power plant.

GARY, IND.—American Sheet & Tin Plate Company, Pittsburgh, Pa., a subsidiary of United States Steel Corporation, New York, plans installation of motor-generator sets, heavy duty motors and controls, switchgear, regulators, conveyors, electric hoists and other equipment for expansion and improvement programs at steel sheet and tin plate mills at Gary, to cost $12,500,000 and $7,500,000, respectively. Project will be

★

FOR SAFETY...

a "dead front" of Bakelite Molded

IN THE CASE of this L. M. disconnecting fuse cutout, a heavy Bakelite Molded door protects the lineman from any chance of shock when inspecting or renewing fuses. The door is molded in one piece, with handle on outside and with the inside formed for the easy assembly of the Bakelite insulated fuse and supports.

For the insulation parts of electrical devices and equipment, exposed to extreme climatic and temperature conditions, Bakelite Molded possesses many advantages. It is strong, has high insulation value, is resistant to moisture, fumes and to temperature and atmospheric variations. It does not deteriorate and retains its electrical and physical properties unimpaired for an indefinite period.

Electrical engineers, Central Station men, and manufacturers are invited to consult our technical staff with regard to unusual insulation problems. We also suggest that you write for copies of the new editions of our booklets 3M, "Bakelite Molded" and 3L, "Bakelite Laminated". These illustrate and describe the latest developments in Bakelite Materials and their applications.

★

Disconnecting fuse cutout with Bakelite Molded cover. Product of Line Material Co., So. Milwaukee, Wis.

BAKELITE CORPORATION, 247 Park Avenue, New York, N.Y. . . . . 43 East Ohio Street, Chicago, Ill.
BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario, Canada

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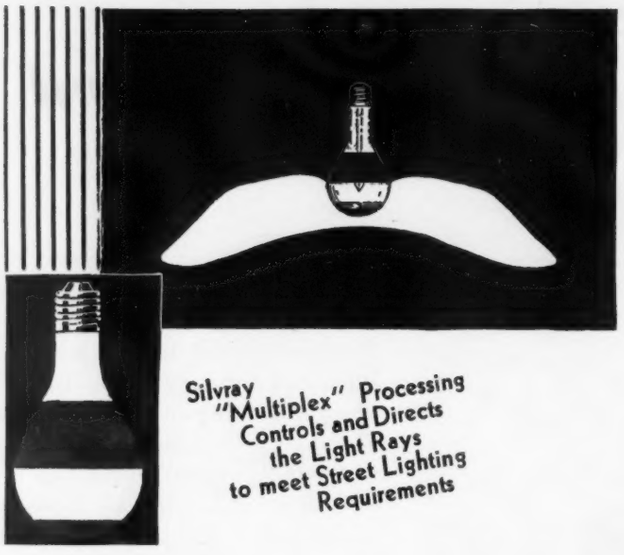
THE MATERIAL OF A THOUSAND USES

MODERN STREET LIGHTING



Silvray "Multiplex" Processing Controls and Directs the Light Rays to meet Street Lighting Requirements

Public Appeal plus SILVRAY "MULTIPLEX" PROCESSING —can build up your Street Lighting Load

Silvray "Multiplex" Processing permits the Utility to present a clean-cut, widely approved plan to Local Civic Authorities for an increase in effective illumination of from 30% to 50% — at an annual additional cost about equal to the present cost of street lamp renewals. In Silvray "Multiplex" Processing, Central Station Executives find also an important key to load building in the commercial field.

Silvray "Multiplex" Processing gives *controlled and directed illumination without the use of separate reflecting devices.* It is adaptable to all standard types of street lighting equipment and is highly endorsed and widely used for *efficiently* and *economically* illuminating streets, boulevards, parks, bridges, service stations and other public places.

Write us for further information regarding Silvray "Multiplex" Processing, or ask that one of our Illuminating Engineers call with reference to making a Survey or Recommendations (without obligation).

AMERICAN STREET ILLUMINATING COMPANY

"Backed by 57 Years' Street Lighting Experience"

261 NORTH BROAD STREET . . PHILADELPHIA, PA.

carried out during 1936. Company engineering department is in charge.

CUERO, TEX.—Plans city-owned electric light and power plant, and electrical distributing system. Fund of $225,000 is being arranged through federal aid. Proposed to ask bids soon. Garrett Engineering Company, Houston, Tex., is consulting engineer.

NAVAJO CAPITOL, N. M.—Purchasing Officer, Department of Interior, Washington, D. C., receives bids until September 19 (postponed from September 5) for Diesel-electric generating equipment and complete auxiliaries for power station at Navajo Capitol, including two operating units with exciters, air compressors, pumping equipment, fuel oil apparatus etc., and three 25-kva. transformers and accessories (Proposal 897); at same time, bids (postponed from September 9) for boilers and auxiliary equipment, same power station (Proposal 908).

BRANDON, VT.—Has plans for new city-owned electric light and power plant. Cost about $150,000. Financing will be carried out through federal aid. Raymond Palmer, 7 Montgomery Avenue, Holyoke, Mass., is consulting engineer.

BIRMINGHAM, ALA.—Alabama Power Company, Birmingham, plans new transmission line from point near Harrell to Catherine, Ala., and vicinity, near Alabama River, about 40 miles. Cost close to $65,000.

WASHINGTON, D. C.—Bureau of Supplies and Accounts, Navy Department, Washington, receives bids until September 24 for 42,200 ft. electric cable for Mare Island, Calif., Navy Yard (Schedule 5935); at same time, for four 2-ton electric hoists, with motors, controllers, magnetic brakes and accessories for Puget Sound, Wash., Navy Yard (Schedule 5945).

TARRYTOWN, N. Y.—Fisher Body Corporation and Chevrolet Motor Company, both Detroit, Mich., affiliated organizations, plan installation of motors and controls, conveyors, electric hoists and other electrical equipment in three new additions at branch plants at Tarrytown, two to be used by Fisher company, and one by Chevrolet company. Cost about $2,000,000. Companies are divisions of General Motors Corporation, New York, N. Y.

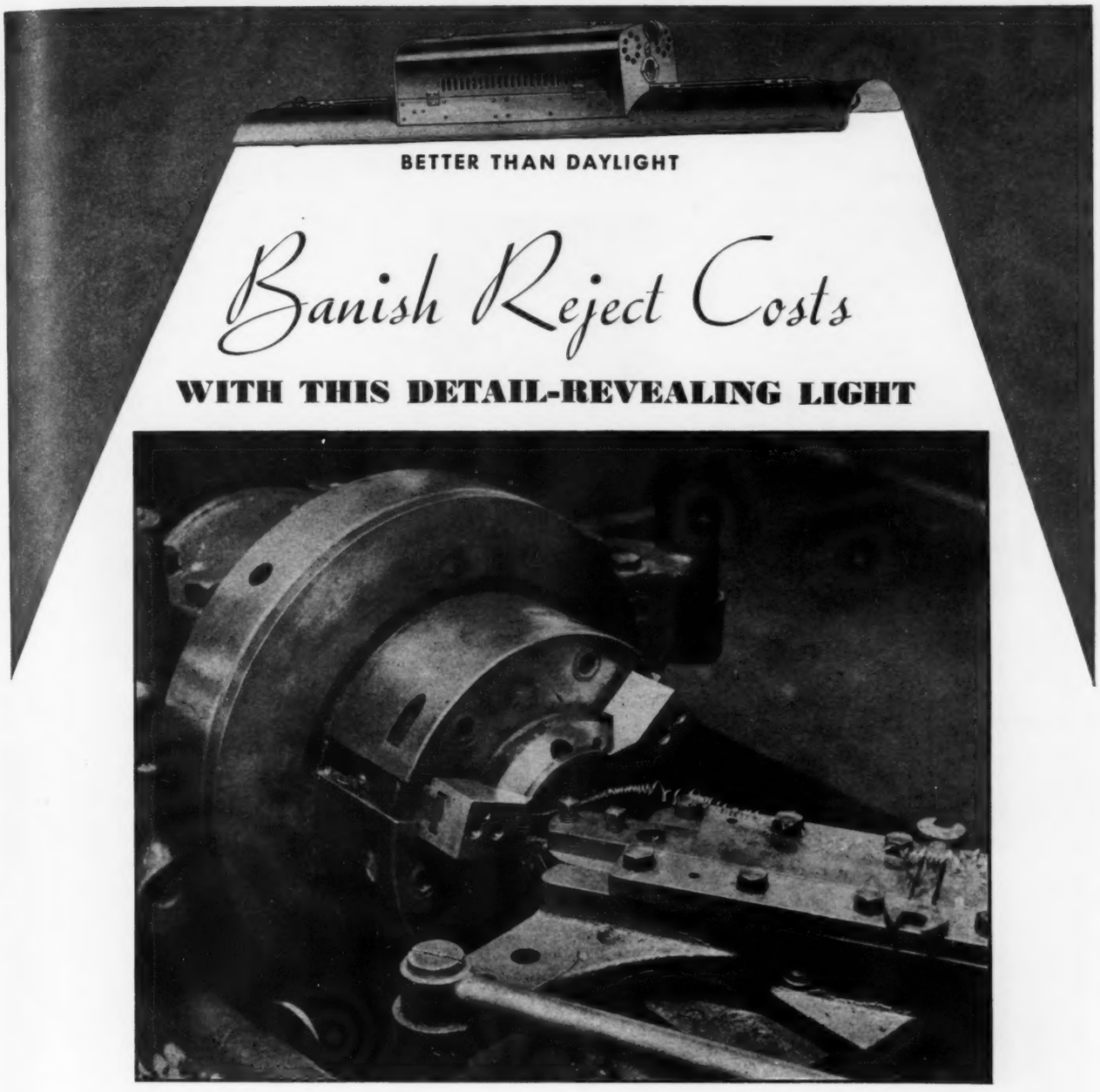
STANBERRY, MO.—Plans new city-owned electric light and power plant, using Diesel engine-generating unit, and electrical distribution lines. Fund of $100,000 is being arranged through federal aid. Henrici-Lowry Engineering Company, West Tenth Street Building, Kansas City, Mo., is consulting engineer.

GRAND RAPIDS, MICH.—Kent Refining Company plans installation of motors and controls, conveyors, pumping machinery, etc., for expansion at oil refinery, to double present output. Cost close to $100,000.

ABBEVILLE, S. C.—Has preliminary plans for new city-owned hydroelectric generating plant on Rocky River, including construction of transmission line to municipal limits, power substation and electrical distributing system. Fund of $350,000 is being arranged through federal aid.

ELK GROVE, CALIF.—Vacuum Wine & Spirits Canning Corporation, Elk Grove, near Sacramento, affiliated with the Elk Grove Winery, same place, plans installation of motors and controls, compressors, conveyors and other electrical equipment in new wine canning plant to operate under special process. Cost close to $100,000. George Wurster heads company.

BALTIMORE, MD.—Purchasing and Contracting Officer, Holabird Quartermaster Depot, Baltimore, receives bids until September 23 for air compressor, motor starting switch, etc. (Circular 36); at same time, for one foam generator (Circular 24).



BETTER THAN DAYLIGHT

Banish Reject Costs

WITH THIS DETAIL-REVEALING LIGHT

Holes, inside threads, even the shadows, are luminous when the lights are Cooper-Hewitts. Glare from polished metal surfaces is eliminated, and scratches are detected without trouble. Cooper-Hewitts enable workers to turn out uniformly better work . . . and maintain first-hour efficiency throughout a shift.

Cooper-Hewitts provide the proper *intensity* of light and the right *quality* of light to provide the maximum in modern lighting comfort. Workers do not have to waste energy in "seeing" . . . for their eyes respond very rapidly and easily to mercury vapor light.

More than sixty different industries have reduced rejects and lowered production costs by using this modern "production tool." The resultant saving in eye fatigue and reduction of accidents in the plant make Cooper-Hewitts truly a profit-producing investment.

Try Cooper-Hewitts on your most difficult lighting job and bear in mind that their operating cost is no more than that of other light of equal intensity. Get full details from any representative . . . Write General Electric Vapor Lamp Company, 805 Adams Street, Hoboken, New Jersey.

GENERAL ELECTRIC VAPOR LAMP COMPANY

648 Copr. 1934, General Electric Vapor Lamp Co.

NEW EQUIPMENT

Rural Line Cutouts

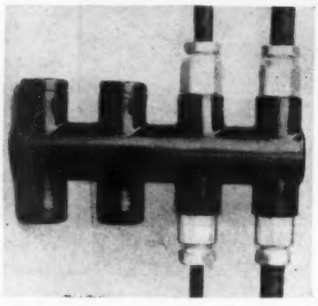
These fused cutouts are said to provide economical and efficient protection to the primary side of the new one- and two-bushing rural line transformers. Hooked over and clamped on the "live" primary wire with a switch stick, a lead is run from the connector to the transformer terminal. Visible indication of fuse outage is provided by a spring throw-out device which ejects the unbound end of the fuse link. This clears "meltouts" instantly and eliminates tube burnouts, it is said.

One size only; maximum current rating 30 amp.; for all voltages to 15 kv. in two styles for copper or aluminum conductors; "HoTap." **W. N. Mathews Corporation**, St. Louis, Mo.

•

Underground Cable Mole

Developed to provide a simple method for making joints in underground secondary distribution systems, this cable mole is used advantageously for connections between rubber, leaded and rubber-covered cables to paper-insulated, oil-impregnated cables. The device makes an effective stop joint in oil-impregnated cables and it entirely eliminates a stub joint, it is claimed. Cables are clamped by simple solderless devices, which in turn are attached to a copper, rubber-insulated body. Because of the entirely solderless assembly, economies are said to be effected with the mole over the use of soldered joints or junction boxes.

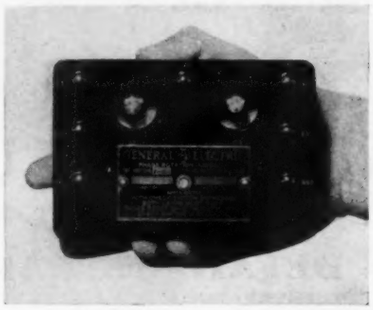


Each connector accommodates range of cable sizes. Combinations for various arrangements of mains and feeders available. **Burndy Engineering Co., Inc.**, New York City.

•

Phase-Rotation Indicator

Useful in three-phase testing and installation work with meters, motors and other equipment, this indicator indicates direction of phase rotation. Two neon glow lamps are used in a simple circuit which requires no adjustment and has no moving parts. Pressing a centrally located button lights both lamps; when the button is released phase rotation is indicated by the lamp which remains lighted.

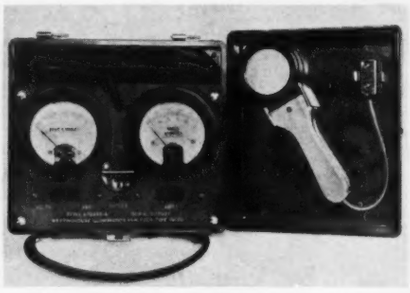


Terminals for 110, 220 and 440 volts provided; instrument dimensions, 5½x3½x 3; weight 12 oz. **General Electric Company**, Schenectady, N. Y.

•

Illumination Analyzer

Consisting of a light meter and combination voltmeter-ammeter with suitable cable connections, in a single case, this illumination analyzer provides an instrument for illumination engineers who wish to determine current and voltage conditions in addition to foot-candle instensities and light distribution.



Range of instruments 0-50 foot-candles: 0-3, 0-15 amp. and 0-300 volts. **Westinghouse Electric & Manufacturing Co.**, East Pittsburgh, Pa.

•

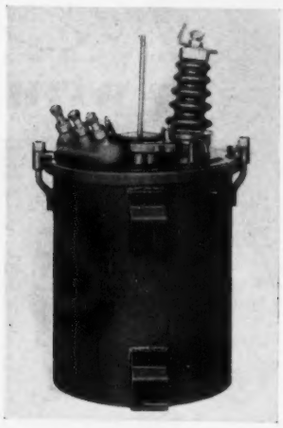
Tree Pruner

This pruner for utility and telephone use features center-cut construction and is equipped with a safety catch which keeps the blade shut when not in use, preventing accidents. When the pruner is in use a compressed spring keeps the blades open. Rope breakage is minimized and easy operation obtained by use of a chain and pulley arrangement to actuate the knife.

Length, 10 in.; Type No. 11, **Seymour Smith & Son, Inc.**, Oaksville, Conn.

Rural Line Transformer

Designed to meet the needs of the new low revenue rural lines, this transformer, for use on single-phase common grounded neutral systems, features flexibility. Core and coil assembly attached to the transformer cover can be rotated as a unit in the tank to permit positioning of the bushings to meet various mounting requirements. The complete transformer assembly can also be removed from the tank for inspection and replaced by one man. Other features include cover type low-voltage bushings, handhole in cover for inspection and tap changing and an adjustable lightning protective gap.

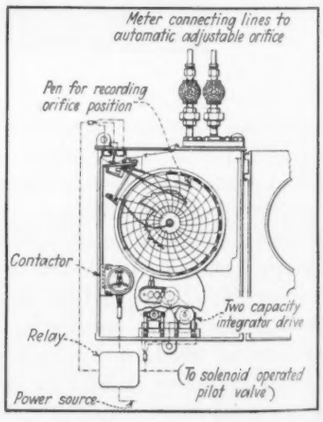


Sizes 1 and 3 kva., single phase; voltage, 2,400, 4,800, 7,200, 7,620. **Maloney Electric Co.**, St. Louis, Mo.

•

Adjustable Orifice

Installed in a pipe line and connected to a standard flow meter, this automatic adjustable orifice greatly widens the range of flow measurement, it is claimed. A sharp-edged orifice segment which rests in either of two positions, depending on the flow rate, varies the size of the orifice opening. The pressure differential across the orifice actuates a contactor, energizing a solenoid valve, which shifts the position of the valve hydraulically. Simultaneously the integrator drive is shifted so that it continues to measure total flow accurately.



Bailey Meter Co., Cleveland, Ohio.

Don't Guess — Ask CONTINENTAL-DIAMOND

PHENOL FIBRE

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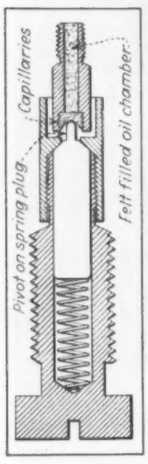
MICA TAPES

There's no need for costly experiment — no reason to waste time and effort in selection — when you need insulating materials. There is an appropriate material for each electrical insulating problem and we can quickly help you determine it. We make *all types* of laminated insulating materials, therefore our recommendations are unbiased. And our service is complete — sheets, rods, tubes — machined, stamped, punched and formed parts. Write for catalogs. Ask to have a sales engineer call when you need help.

CONTINENTAL-DIAMOND FIBRE COMPANY
NEWARK, DELAWARE

Improved Meter Bearing

This jeweled bearing and pivot arrangement was developed for use in watt-hour meters to permit improved accuracy to be obtained. Oil-soaked felt above an inverted jewel lubricates the cup of the jewel by capillary action. Because of the position of the jewel the bearing is said to be less subject to action of impurities and abrasion products than the present jewel bearings. When in operation the pivot point describes a constant minute circular motion in the jewel cup due to side thrust of the meter. This causes the pivot to skate on an oil film, reducing pivot and jewel wear.

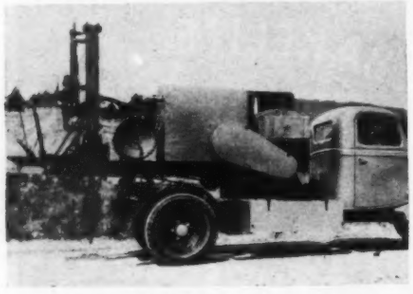


Synthetic sapphire jewels used. **Herman D. Steel Co.**, Philadelphia, Pa.

•

Concrete Breaker

This machine is said to meet the needs of utility companies for a compact, light and fast concrete breaker. It breaks out small jobs at a long distance quickly and reduces cost many times, it is stated. The machine will cut widths ranging from 1 in. to 5 ft. 4 in. in one operation. It can also be used for tamping and breaking up frost. All controls are at the operator's fingertips.



Equipped with 180-cu.ft. air compressor, V-belt drive, Buda motor and self-starter; mounted on Ford V-8 truck. **Concrete Cutting Corporation of America**, Brooklyn, N. Y.

•

Large Slip-Ring Motor

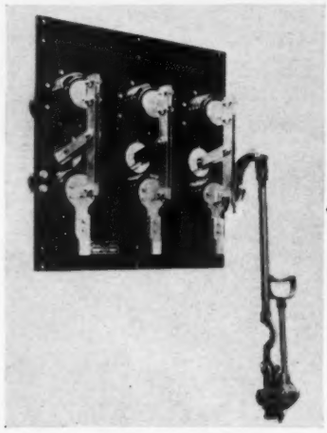
Designed to provide special protection under heavy service conditions these motors differ from conventional inclosed fan-cooled types, having the cooling fans located on the shaft extension at the top, opposite the driving end. Slip rings are at the bottom with dust-tight covers and a free outlet for air. Thrust load is taken at the top by a double-row, deep-groove radial ball bearing. Lower bearing is also double row of the self-aligning type.

Rating 75 hp., 690 r.p.m., 208 volts, three phase, 60 cycles. **Harnischfeger Corporation**, Milwaukee, Wis.

•

Group-Operated Switches

These tongue-type, group-operated, three-pole, indoor, disconnecting switches are provided with double blades and an operating mechanism which can be locked in either open or closed position. The switch illustrated is provided with top insulators of the back-connected bushing type; the lower front connected. Straight front or back-connected bushings or various combinations are available.

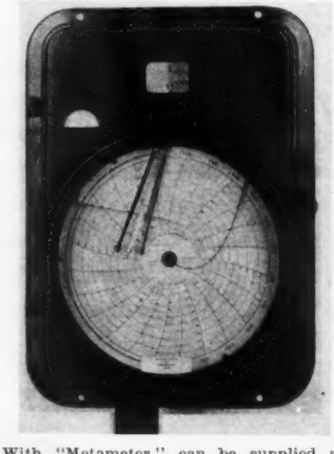


Type "3 CJH-34" 7.5 kv.; 400-amp. size shown; steel base arranged for flush or pipe mounting. **Delta-Star Electric Co.**, Chicago, Ill.

•

Mechanical Flow Meter

Employing the mercury manometer system of flow measurement, this mechanical flow meter is said to give precision measurement under severe field conditions. Different ranges of operation are obtainable by changing either the size of the orifice, the high-pressure leg of the manometer or both. Hairline sensitivity and sustained accuracy are obtained at the pen by use of a long lever arm between float and pen, it is claimed. Meter bodies are of forged steel.

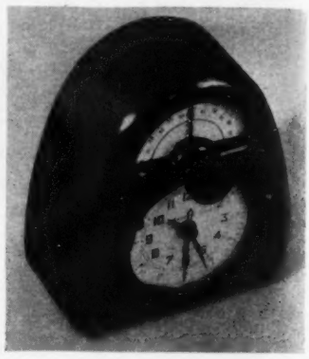


With "Metameter," can be supplied as electric flow meter for remote reading; available as indicator, integrator, recorder or controller; recorders can be furnished with pressure and temperature elements. **The Bristol Co.**, Waterbury, Conn.

•

Interval Timer

Used for precision timing of various processes, this device measures time intervals from one to 120 minutes and is provided with a second hand to indicate fractions of a minute. The bakelite case is acid resisting and dielectric.

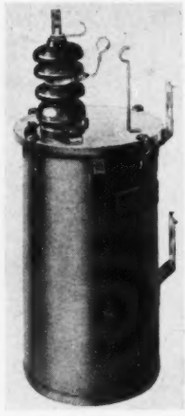


Measured Time, Inc., La Porte, Ind.

•

Rural Line Transformers

Intended for low-cost rural extensions, these units are designed for four-wire systems with solidly grounded neutrals and are provided with a single bushing in the cover, coordinating gap for lightning protection and simplified hanging arrangement. Aimed to contribute to the national rural electrification program.



Ratings 1 and 3 kva. at 2,400, 4,800, 7,200 or 7,620 volts. **Allis - Chalmers Mfg. Co.**, Milwaukee, Wis.

•

Auxiliary Range

Designed for homes where entertainment or other reasons make a large oven and broiling capacity necessary, this range is equipped with an oven of 10,468 cu.in. capacity. Both broiler and oven are provided with a 4,000-watt heating unit. No surface units are provided. Accurate temperature regulation is provided by means of a graduated dial on the range top.

Type KOB Waldorf. **Electromaster, Inc.**, Detroit, Mich.

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A THINKING PUZZLE?
NOPE, A HI-LINE ASSEMBLY!
NO DANGER WITH B.T.C. DROP FORGED HI-LINE HARDWARE--ASSURED UNIFORMITY IN DIMENSIONS,
THE BREWER-TITCHENER CORP.
CORTLAND, N.Y.
THROUGH YOUR INSULATOR MANUFACTURER ONLY

ENGINEERING DATA FROM MANUFACTURERS

Bulletins and catalogs now available to engineers by manufacturers and associations

"Quick-Clean" motors are the subject of Allis-Chalmers bulletin No. 1172, which describes the construction features of this new type motor. Leaflet No. 2100 is devoted to the construction features of the type ARY wound-rotor induction motors, and may also be obtained from Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

A series of seven leaflets describing pumps for various applications are now available from the Worthington Pump & Machinery Corporation, Harrison, N. J. Bulletins W-102-B1 and 103-B1 deal with duplex piston pumps, W-317-B4 and 321-B2A cover vertical and horizontal centrifugal pumps, W-316-B3 and W-450B22 detail the features of sewage and sump pumps, while bulletin L-800-B1 covers air-lift pumping systems.

A number of leaflets available from the General Electric Company describe the operation, features and characteristics of a number of recently developed devices. The list includes GEA-1943A on the new surge crest ammeter, GEA-1972 is on the type FK-144A high-speed circuit breakers, GEA-2096 on the bushing potential device, GEA-2122 on electric tachometers, GEA-1093A on watt-hour meters for switchboards, GEA-2127 describes a line of knife switches, GEA-2124A deals with the new contact-making voltmeter, GEA-2123 on type EF-2 disconnecting switches, GEA-2080 on a.c. and d.c. solenoids, and bulletins GEA-1114-a, 1423 and 1847A on solenoid-operated valves.

Bulletin W-200-B2A of the Worthington Pump & Machinery Corporation, Harrison, N. J., devotes 4 pages to the design features of its new surface condensers.

An activated alumina system for air conditioning and controlled dehumidification in processing rooms is described in a 4-page bulletin of the Pittsburgh Lectrodryer Corporation, Pittsburgh, Pa. The discussion describes the device, its use and results obtained with it.

Proposed tentative specifications for bare, stranded, copper cable are contained in a report of the American Society of Testing Materials, Philadelphia, and may be obtained by writing the secretary-treasurer of the society.

Two bulletins have been recently announced by the Hevi-Duty Electric Company, Milwaukee. Bulletin HD-735 describes uses, construction, control and operation of the electric organic combustion furnaces, while bulletin HD-635 details the features of the pot-type electric furnaces. In both bulletins tabulated specifications are included.

"Air-Operated Combustion Control" is the title of bulletin No. 102, 31 pages, now obtainable from the Bailey Meter Company, Cleveland. This bulletin describes a complete control system which automatically maintains steam pressure, combustion efficiency and furnace draft. Diagrams and photographs illustrate various typical applications.

Design features of automatic starters are outlined in a pamphlet, bulletin 709, obtainable from Allen Bradley Company, Milwaukee, Wis.

Curves showing the thermal characteristics of its high-temperature box furnace are included in bulletin HDT-235 of the Hevi Duty Electric Company, Milwaukee, Wis.

JIM FAIRMAN,

Electrical Engineer, Brooklyn Edison Co., Inc.

checks over plans with GEORGE READ

Division Engineer

APPROVING plans is just one of Jim Fairman's many responsibilities. Some of the others are included in the following typical day's work:

Reviewed electrical system trouble report for previous day and phoned R. T. Oldfield, Senior Electrical Engineer of Public Service Commission regarding details of a case of system trouble.

Presented to Vice President Harry Woodrow, weekly list of construction and maintenance jobs covering station electrical equipment and distribution system.

Attended bi-weekly conference of representatives of electric, gas, and steam companies of Consolidated Gas System on engineering and accounting problems of the Continuing Property Record.

Lunched with Alexander Maxwell and Jim Coleman of E.E.I. general office and discussed plans for symposium on air conditioning at next meeting of Electrical Equipment Committee.

Approved change in practice of testing 27-kv feeders.

Conferred with Lem Moffitt, Assistant Superintendent of Distribution, on plans for reconstruction of manholes and duct lines made necessary by street widening and consequent relocation of car tracks.

Dropped in on discussion between company engineers and manufacturer's representatives regarding station apparatus troubles.

Called out to discuss plan of service for Williamsburg Slum Clearance Housing Project with Charlie Nicholson of Sales Department.

Released monthly revision of annual load forecast to executives and interested department heads.

Reported to Harry Woodrow findings in a severe case of electrolysis and discussed plans for metering changes involved under new City contract.

• *He checks Electrical World, too*

Jim Fairman has been reading ELECTRICAL WORLD for over 10 years and finds it "very helpful and suggestive of things to look into . . . read it regularly and within a week after receipt."

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They all tie in . . .

This year the electrical industry is to profit from fire prevention activities during the week of October 6th . . . directly and indirectly.

There is indirect profit to all in safeguarding electric service in the home.

There is direct profit from timely, visible tie-in with this great nation-wide movement.

It will give a lift to the business accruing from the public education being carried on by the "Safeguarding Electric Service In The Home" campaign . . . now blanketing the nation with lectures, exhibits, displays. Around this movement, based on the need for approved, labeled cord and other devices the whole "Safety in Wiring" program revolves. They are intertwined.

If you have not yet participated—get in touch with your local inspection bureau. They will advise you of how you can make the most of a movement directly affecting your business. If you are demanding APPROVED LABELED CORD and approved materials, you have the basis for cooperation.

Recent Rate Changes

Pennsylvania Power & Light Company has filed with the state Public Service Commission a new rate schedule which will save 250,000 consumers $1,500,000 annually. The new residential rate is as follows: A monthly minimum charge of $1 for which the consumer may use 11 kw.-hr., 6.5 cents per kilowatt-hour for the next 46 kw.-hr., 3 cents for the next 70 kw.-hr., 2 cents for the next 130 and 1.5 cents for all additional electricity used. This new schedule is to become operative October 1. The new schedule also provides changes in commercial rates. The filing of the new schedule is the result of the acceptance by the commission of the company's offer to cut rates. The offer was made after the commission, announcing conferences with the company officials had failed to bring agreement to cut rates, instituted a rate inquiry (ELECTRICAL WORLD, August 17, page 102). This inquiry is to be continued despite the new schedule in order that the commission may learn if the rates are just or if a further reduction is needed.

•

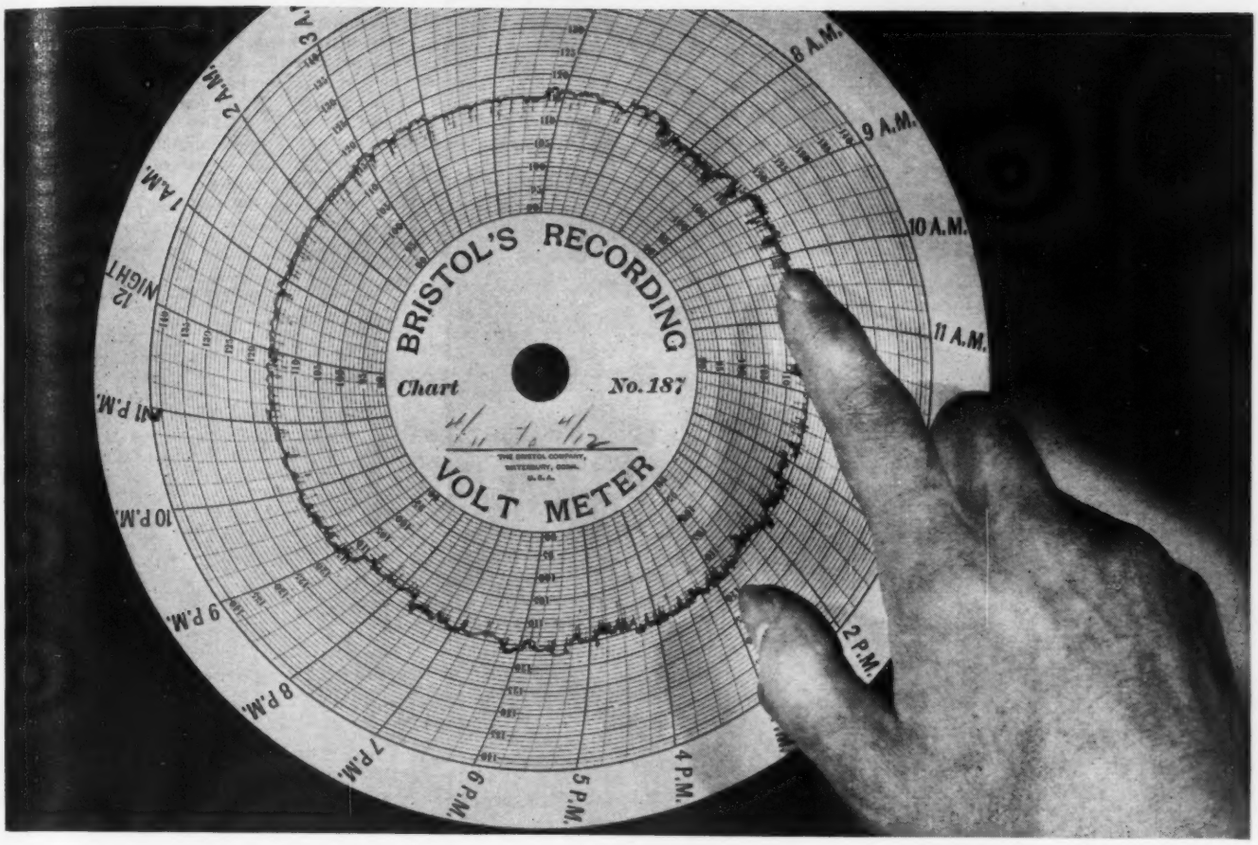
Arkansas State Department of Public Utilities has issued an order directing six major power companies to file individual rate schedules by September 15. The order was issued following the filing of a report by a special committee representing the utilities. The new schedules are to embody the general principles outlined in the report of the committee, including new immediate and objective rates for residential and commercial purposes. The committee was recently appointed at a conference of power officials with the commission (ELECTRICAL WORLD, August 3, page 81) at which the power companies were requested to show cause why a uniform objective rate, designed to increase use of electricity without a material increase in monthly bills, should not be put into effect. The companies include Mississippi Valley Power Company, controlled by the Oklahoma Gas & Electric Company; Southwestern Gas & Electric Company, Arkansas-Missouri Power Company, Citizens Electric Company, Arkansas Utilities Company and Arkansas Power & Light Company.

•

Jacksonville, Fla., municipal electric light plant will put into effect on October 1 a lower rate for all residential users of electricity, particularly for consumers now having refrigeration service on the illumination charges. Within the city limits the residential rate under the plan will be on the following basis: 7 cents per kilowatt-hour for the first 35 kw.-hr., 5 cents for the next 40 kw.-hr., 2 cents for the next 225 kw.-hr. and 1½ cents for all energy used in excess of 300 kw.-hr. per month. Outside of the city limits the rate will be: 10 cents per kilowatt-hour for the first 35, 7 cents for the next 40, 3 cents for the next 225, and all over 400 kw.-hr. 2 cents. At the present time the home users of electricity, who are not privileged to the so-called "cooking and heating" rate, are paying 7 cents per kilowatt-hour for energy. The present "cooking and heating" rate is on a 7-5-2-cent basis.

•

Public Service Company of Northern Illinois has recently made a rate revision which effects a reduction of minimum bills for rural service by about 40 per cent. Previously a new farm customer was required to guarantee a monthly payment, as a minimum bill, equal to one-fiftieth of the cost of the line extension to serve him. The company will now construct a farm line ex-



Checking consumer's voltage *is good business, too!*

Although in many localities a daily record of the voltage is required by law, to keep such a record by choice is also good business. Particularly an uninterrupted 24 hour chart of the voltage at the consumer's premises.

Then when complaints about the service arise, there will be no need for arguing. The information which the chart records provide speaks for itself. Not only does it show the voltage every moment of the day and night, but also all fluctuations, their duration and the time they occurred.

For this purpose Bristol's Recording Voltmeter, Model 511, is recommended and widely used. As The Montana Power Company say, "We use this voltmeter not only as a daily record required by law but also for its importance in our business in settling complaints."

Write for Catalogue 1502-V.

•

Above: *Eight inch round chart with distribution voltage record made by Bristol's Recording Voltmeter, Model 511, for The Montana Power Co., Butte, Mont.*

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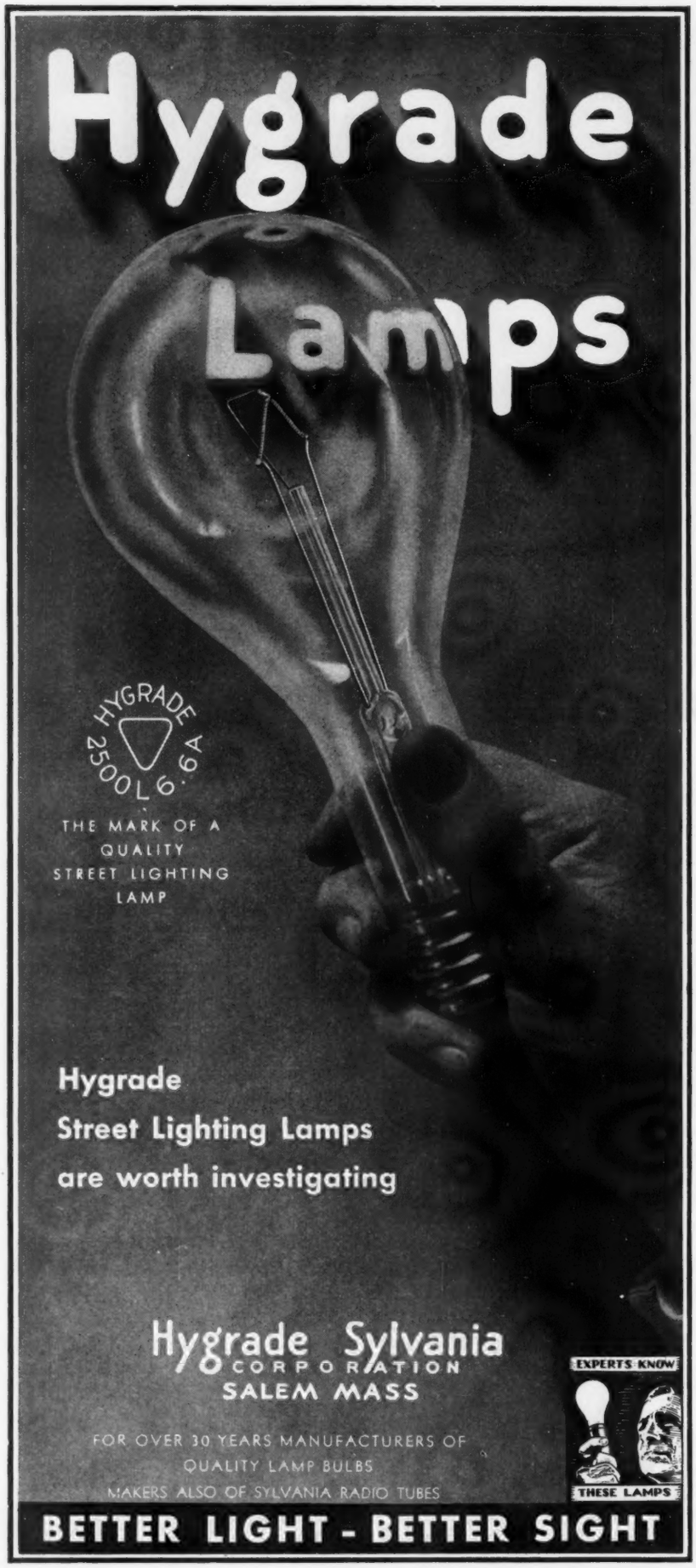

tension for a rural customer or group of customers on the basis of a minimum monthly charge for service amounting to approximately one-eightieth of the construction cost of the line, but not less than $3.50 per month. Past experience shows that uses of electric service on the farm usually exceed the minimum guarantee. The new rate is available to existing customers who elect to come under it, but the old rate of fifty-month pay-off may not be taken by new customers. The effect of the new rate will be to allow service to be extended into territory of lower customer density than was possible before.

•

New York Central Electric Corporation's revised electric rates which offer lower charges to residential customers using an electric range or water heater have been approved by the state Public Service Commission to become effective at once. In addition to the revised rates for residential service by customers with an electric range or water heater, the company has filed schedules of lower residential rates which become effective October 1. Under the changes, which will be effective in October, customers will save more than $50,000 anually.

•

Eaton Lighting Company, Eaton, Ohio, has lowered its rates for both residential and commercial consumers. The new resident rates are: 7 cents per kilowatt-hour for the first 40 kw.-hr. per month, 6 cents for the second and 3 cents for all additional energy used. The old rate was 8 cents for the first 40 kw.-hr. Commercial rates are reduced from 8 to 7 cents for the first 50 kw.-hr., 6 cents for the next 50, 4 cents for the next 100 and 3 cents for all additional.

•

New York Edison's new rates for breakdown service were protested in a petition filed by the Electric Plant Owners Association with the state Public Service Commission, requesting suspension of the new schedule. The new rates, which went into effect at the time the company reduced rates for domestic consumers, were arbitrarily made higher for the purpose of forcing discontinuance of private plants, the petition charges.

•

Rochester Gas & Electric Corporation has been authorized by the New York Public Service Commission to revise its electric rates, the revision including a provision in all the company's residential rates for a reduction in bills to customers having electric water heating systems. The change is effective August 17.

•

Southwestern Gas & Electric Company has been authorized by the Arkansas State Department of Public Utilities to reduce its rates for all rural consumers. The rate reduction provides for a reduction of 15.6 per cent.

•

Lexington Utilities Company inaugurated a new schedule of rates on August 1, when a reduction in electric rates, representing an estimated saving to consumers of $187,951 a year, became effective. The reduction was approved last month by the Kentucky Public Service Commission.

•

Salem Electric Light Company made effective August 15 the new lighting rates as agreed upon with the Salem Citizens' Protective Committee at a hearing before the state Board of Public Utilities. It was announced earlier that the new rate would not become effective until next year. The company made a reduction April 1. The

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•

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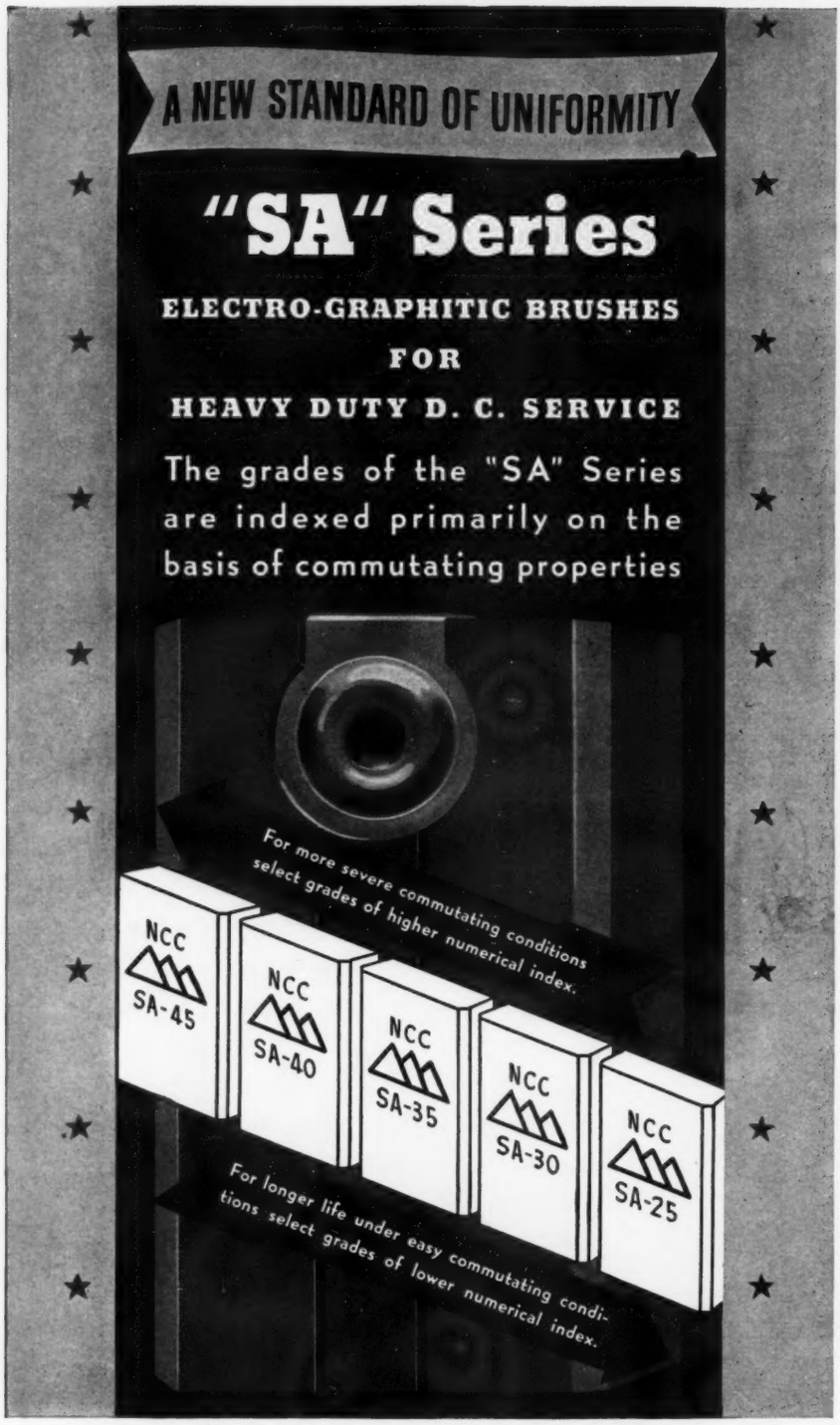
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•

Puget Sound Power & Light Company won a victory over the Washington State Department of Public Service on August 16 when the state Supreme Court ruled that the state could not collect investigation costs from the companies investigated. The court, reversing a Thurston County Superior Court decision in five suits brought by the department to collect costs from the Puget Sound Power & Light Company, Winlock Water Company, Oregon-Washington Telephone Company, Northwestern Electric Company and the Interstate Power & Light Company, declared unconstitutional the 1933 law under which the department under the leadership of E. K. Murray, now resigned, launched an investigation program against practically every utility in the state. Despite the ruling, Fred J. Schaaf, director of the Department of Public Services, stated that the Puget Sound Power & Light Company must pay the department the $100,000 in costs it agreed to pay under recent rate reduction program.

•

Municipal Items

MILLEDGEVILLE, GA.—Governor Talmadge's administration, which repeatedly has attacked New Deal lending agencies, has applied to the P.W.A. for $350,000 to build a state-operated power plant. The money is to be used for the erection of a heating, light and power plant to serve the State prison farm, the State Women's College and hospital for the insane, all at Milledgeville.

CENTRALIA, ILL.—United States District Court for the eastern district of Illinois at Danville has granted a permanent injunction restraining the city from proceeding with the construction of a municipal light and power plant. The litigation against the municipal project was brought by individual Centralia taxpayers. The Illinois Power & Light Company serves the city. Federal Judge Walter C. Lindley held that the proposal was not in compliance with the state laws and constitution. He declined to pass on the question of federal constitutionality. P.W.A. had allotted the city a grant of $117,000 and a loan of $300,000, which was to be supported by $300,000 in bonds voted by the city.

WAVERLY, IOWA.—A special election has been called for September 24, when residents of the community will vote on a proposition to grant the Central States Power & Light Company a ten-year franchise to serve the community with light and power.

BURLINGTON, KAN.—P.W.A. has been forbidden to grant a loan to the city for the construction of a municipal power plant by a preliminary injunction issued by Judge Jesse Adkins in the District of Columbia Supreme Court. The injunction was sought by the Kansas Utilities Company.

SUMMERSVILLE, MO.—Mayor Dewoody has filed a new application for P.W.A. funds for the proposed municipal light and power plant and distribution system. The city is now seeking a grant of $10,808 and a loan of $13,210. It is proposed to issue general obligation bonds to cover the loan.

KIRKSVILLE, MO.—Application has been made to the P.W.A. for a grant of $287,565 to help finance the construction of and equipment for a municipal light and power plant to cost $639,035.

NEBRASKA.—P.W.A. has recommended to

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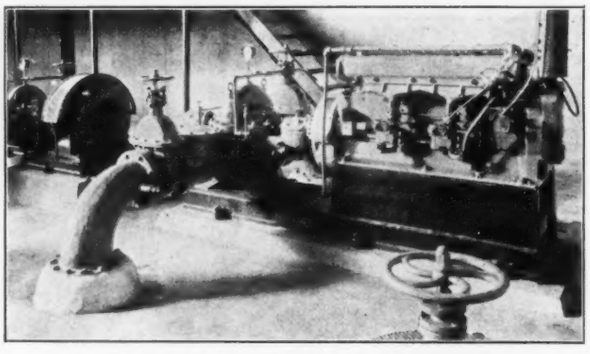

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the work division a loan and grant of approximately $20,000,000 to the Tri-County power and irrigation project in central Nebraska. The application called for a 45 per cent grant and 55 per cent loan. Two power and irrigation projects in the state have already been approved and work has started. The Loup River public power district was allotted $8,700.000 and the Platte River district was granted $9,700,000. These two will be in operation by the summer of 1936. Senator George W. Norris is sponsoring the Tri-County project in opposition to Arthur F. Mullen, attorney for the other two projects. The opinion is held in some quarters that the state, with its 1,300,000 population, would be more than amply supplied with electrical energy from the two smaller plants. Another undertaking, the Middle Loup project, a short time ago received tentative approval of the P.W.A. for approximately $1,000,000 and Southeastern Nebraska public power district, primarily a rural distribution project, has obtained final approval for approximately $475,000. The two latest bids for government funds are to finance the construction of a hydro-electric power plant and irrigation dam 5 miles north of Lewellen, a project calling for a loan and grant of $630,000 and for a rural electrification project, known as the Polk County Rural Public Power District. Directors of this project plan to ask for $250,000.

LOCKPORT, N. Y.—Application has been made for $2,000,000 funds for erection of a municipal electric plant. Objections to the project have been filed by the Niagara Hudson Power Corporation and the Associated Gas & Electric Company. Common Council has recently adopted a local law calling for a referundum at the general election in November.

JAMESTOWN, N. D.—City Council has passed an ordinance authorizing the issuance of $60,000 bonds to finance the establishment of an electric light and power plant.

PLAINVIEW, TEX.—Justice Jesse C. Adkins of the District of Columbia Supreme Court has granted a preliminary injunction restraining Secretary Ickes from granting P.W.A. funds for construction of a municipal plant. The action was brought by the Texas Utilities Company.

TAYLOR, TEX.—City Council has withdrawn its preliminary application to the P.W.A. for a loan and grant of $50,000 for construction of a municipal electric light and power plant. It was explained by the Council that after further consideration it was determined that now is not the proper time to undertake the project.

DANVILLE, VA,—Judge Henry G. Leigh has fixed October 1 as the date on which citizens will vote to determine whether the city shall issue $1,513,000 P.W.A. bonds, which, with the $1,237,909 federal grant, will provide funds necessary to develop the large hydro-electric plant at The Pinnacles in Patrick County.

GALAX, VA.—Hearing on the application of the town for a loan and grant from the P.W.A. for the construction of a municipal power plant was held recently before Col. James Anderson, acting state P.W.A. director. Counsel for the Appalachian Electric Power Company vigorously opposed the project, while officials of the town supported it. The briefs on each side will be sent with the application to Washington.

CŒUR D'ALENE, IDAHO.—Plans of the city to go into the municipal power business were blasted recently when Judge C. C. Cavanah of the United States District Court ruled at Boise that the arrangements to finance the project could not be approved.

Judge Cavanah decreed that the city be perpetually enjoined from entering into a proposed contract for construction of a Diesel engine generating plant and an electric distribution system and that Harold Ickes, federal Administrator of Public Works, be permanently restrained from making a loan of $337,580 for the power plant and system. The Washington Water Power Company brought suit and a temporary injunction was granted. In its suit the power company brought out that it had invested $5,000,000 in construction and improvement of its electric facilities in Idaho and that it was rendering adequate service at reasonable cost. "Congress would have no authority," Judge Cavanah said, "to appropriate or grant authority to devote national funds to enable the city to construct and operate a municipal electric plant for the generation and distribution of electricity, except in instances specifically granted by the Constitution, of which the proposed loan and grant is not one. The power to tax and to appropriate public moneys of the United States is restricted to purposes national in character and not matters of local benefit . . ." The city plans to appeal to the federal Circuit Court and, if necessary, to the United States Supreme Court.

WISCONSIN.—A majority of Burnett and Polk county voters favored establishment of a municipal power district at a recent election, but failure of seven municipalities to approve the project leaves the entire undertaking up in the air. Four villages and three townships voted against the proposal. It was the first referendum in the state under the 1931 power district law. The law provides that these municipalities need not join the power district. As this means that the district would be smaller than originally planned, the state Public Service Commission must again approve or disapprove the project. The commission, ruling upon the original plans in June, decided the project was feasible, but only if certain conditions were met. These were that outside financial aid be obtained to start the district, that the original debt be kept low, that interest rates on bonds be less than 6 per cent, and that there be a sizable saving on the general expenses of the present private utilities.

SEATTLE, WASH.—Home Rule Power League, which calls for purchase of all private power properties in western Washington and the Wenatchee district, has been organized with headquarters in Seattle. The league program would be accomplished by formation of separate power districts. Each district would float its own utility bond issue under the sponsorship of its principal city, with no general obligation involved, to purchase and operate the private distribution lines within its borders. These individual districts would be linked into a league and bonded jointly to pay for and operate the power plants and transmission lines supplying the group of districts. Elections would have to be held in Seattle and all other sponsoring cities to get the voters' sanction and also in various smaller communities which already own small municipal power systems. The Puget Sound Power & Light Company.

BROWNWOOD, TEX.—Following the recent action of the city commission in refusing to call an election to determine whether the recent franchise granted by the city to the Brownwood Public Service Company for the construction of an electric light and power plant is valid, attorneys for the Texas Power & Light Company have filed suit in the district court to void the franchise. The Council refused to call an election on the grounds that the petition submitted did not contain sufficient signatures.

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World Electric Energy Output by Countries

Production of electricity in various countries as given in the accompanying table includes, as far as possible, (a) the total production and (b) the amount produced by establishments supplying energy to third parties, excluding "auto-producers"—*i.e.*, industrial, transport or private establishments generating energy for their own use. The second group therefore consists essentially of central stations or their equivalent. In the case of several countries, however, the total production is not known, nor is the exact scope of the published statistics defined.

The table is condensed from one that appeared in Electrical Foreign Trade Notes, April 5, 1935, published by the Electrical Division of the Department of Commerce, and giving statistics for each year from 1924 to 1933, inclusive, so far as they are available.

The same issue contains many other data on the electrical and radio industries. No information is given on installed capacities in the various countries. This is not an oversight, but is due to the fact that with a few exceptions published data on this item are virtually non-existent.

Electricity Production by Countries

In Millions of Kw.-Hr.

Total production in italics; public utility output only, roman type

Country	1929	1932	1933
Africa			
Algeria[1]	112	166	.....
Morocco (Fr.)[2]	.....	98	109
Hydro	.....	50	58
Steam	.....	48	51
Un. of S. Africa (*a*)[1]	2,454	.....	.....
America			
Canada[3, 4]	17,963	16,052	17,553
Hydro	17,695	15,726	17,239
Steam	268	326	314
United States[4]	*120,000*	.....	.....
United States	90 084	80,158	81,306
Hydro	30,956	34,062	31,591
Steam	59,128	46,096	49,715
Newfoundland	†795	.....	.....
Mexico	†1,464	*1,425*	*1,589*
Argentine[1]	†1,433	1,593	.....
Argentine (Buenos Aires)[3]	829	1,003	.....
Chile	275	284	313
Uruguay (*b*)	125	.....	.....
Asia			
Fr. Indo-China	*63*	*64*	.....
Japan	13.312	15,951	.....
Hydro	11,562	1,614	.....
Steam	1,750	14.337	.....
Netherland Indies[3]	205	234	222
British Malaya[1, 6]	*199*	*144*	*119*
Philippines	*90*	*109*	*115*
Europe			
Germany	*30,661*	*23,460*	.....
Hydro	*3,564*	*4,021*	.....
Steam	*27,097*	*19,439*	.....
Germany	16,391	13,423	14,650
Austria[3]	**2,500*	**2,400*	.....
Belgium[5]	*4,043*	**3,932*	**3,902*
Belgium[3]	1,768	1,872	.....
Bulgaria	86	121	128
Hydro	49	68	77
Steam	37	53	51
Denmark[3]	*545*	.....	.....
Denmark (*c*)[3]	374	391	.....

[*Continued on page 105*]

Spain[2,9]	2,433	2,795	.....
Esthonia[1]	31	37	.....
Finland	995	1,479	.....
Hydro	.....	1,125	.....
Steam	.....	354	.....
France[10]	14,319	13,590	14,750
Hydro	6,121	5,882	.....
Steam	8,198	7,708	.....
Greece[8]	102	.....	.....
Hungary[8]	703	687	.....
Irish Free State (c)[3]	†135	167	.....
Italy[11]	*9,815*	*10,227*	*11,181*
Hydro	*9,427*	*9,934*	*10,844*
Steam	*388*	*293*	*337*
Latvia[8]	81	91	.....
Norway[3]	*9,200*	*9,150*	.....
Netherlands[8]	1,604	2,047	.....
Poland[8, 12]	*2,355*	*1,800*	*1,888*
Poland[12]	1,785	1,374	.....
Portugal	*240*	*286*	.....
Hydro	*73*	*103*	.....
Steam	*167*	*183*	.....
Portugal	187	228	.....
Roumania	*500*	*544*	.....
Hydro	*61*	.....	.....
Steam	*439*	.....	.....
Roumania	290	310	330
United Ki gdom (c)[14]	15,800	*17,139	*18,886
Hydro	*136*	.....	.....
Steam	*15,670*	.....	.....
United Kingdom (c)[14]	*10,401*	*12,499*	*14,176*
Saar[8]	*889*	*808*	.....
Sweden[3]	*4,967*	*4,903*	*5,350*
Switzerland[3]	*5,300*	*(d)4,807*	.....
Switzerland[3]	3,509	3,655	3,870
Czechoslovakia[1]	*3,036*	*2,653*	.....
Czechoslovakia[1]	1,218	1,319	1,340
Yugoslavia	460	.....	.....
Turkey (Istanbul)[4]	65	85	.....
U.S.S.R.[1]	6,252	13,390	15,855
U.S.S.R.[1, 7]	*2,786*	*9,217*	*11,400*
Oceania			
Australia(b)	*2,286*	*2,507*	.....
New Zealand(c)	*710*	*832*	.....

*Estimate or provisional figure. †1930.

(a)—(d) Twelve months ending: (a) April 30 of the following year; (b) June 30; (c) March 31 of the following year; (d) September 30.

[1]Algeria, Union of South Africa, Argentina, British Malaya, U.S.S.R., Estonia, Czechoslovakia: mainly energy generated by thermal plants.

[2]Morocco (Fr.), Mexico, Netherlands Indies, Austria, Spain: mainly energy generated by hydraulic plants.

[3]Canada, Irish Free State, Norway, Sweden, Switzerland: practically all energy generated by hydraulic plants.

[4]Canada—central electric stations, including some industrial undertakings selling surplus power and also the small production by reserve equipment in non-generating stations. The data represent about 90 per cent of the total output of the country.

[5]Argentina (Buenos Aires), Turkey (Istanbul), Belgium, Netherlands: energy entirely generated by thermal plants.

[6]British Malaya: prior to 1928, not including Government plants, the output of which amounted to about 10 per cent of total output.

[7]U.S.S.R.: "regional stations"; municipal and agricultural stations are excluded.

[8]Denmark, Greece, Hungary, Latvia, Poland, Saar: practically all energy generated by thermal plants.

[9]Spain: prior to 1928 stations with installed capacity of over 3,000 kw.

[10]France: including a certain amount of energy employed directly by the mining, electro-chemical and electrometallurgical industries without passing through the distribution systems and which it is impossible to separate from the total.

[11]Italy: the increase shown is partly due to the scope of the statistics having been extended.

[12]Poland: stations with installed capacity of over 5,000 kw.; the data represent about 75 per cent of the total production of the country.

[13]Poland (*P.*): includes a certain amount of energy employed directly by industries which only sell current occasionally; includes also the energy employed by the auxiliary services of the plants and which amounts to about 4.5-5 per cent of the total.

[14]United Kingdom: excluding Northern Ireland.

Supplementary Data on World Electric Customers

Supplementing the table in the ELECTRICAL WORLD of August 3, page 82, statistics have been received for Chile, as follows:

1 Total number of consumers	382,348
2 Domestic consumers	287,524
3 Commercial consumers	86,775
4 Industrial consumers	4,146
5 Agricultural consumers	2,753
6 Government and municipal consumers	1,150

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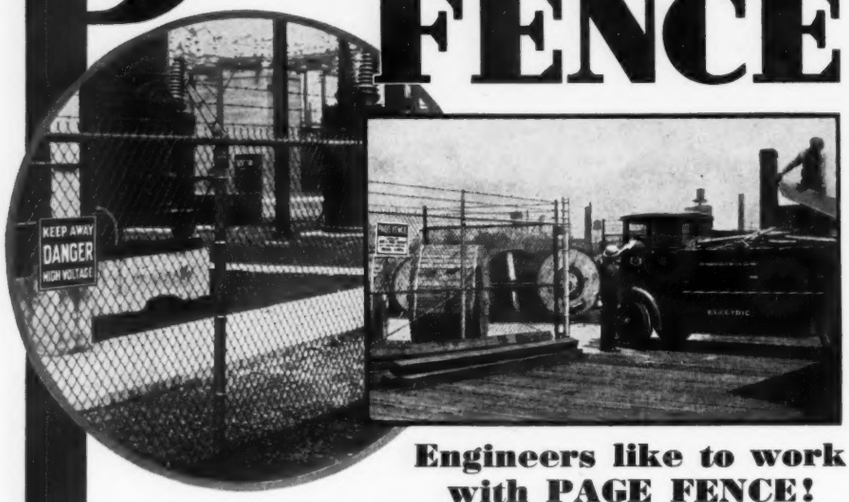

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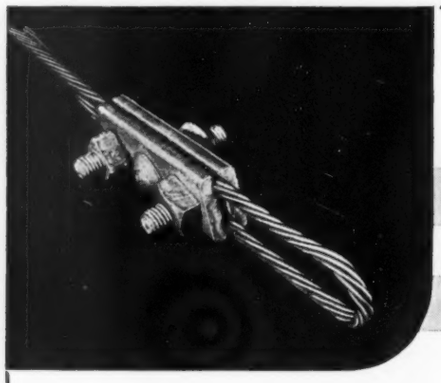

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General Electric Plans Home Lighting Course

More than seventy utility executives from every section of the country recently gathered at Nela Park's General Electric Institute to preview the new G.E.-LaSalle home-lighting sales-training program which General Electric is offering to utilities, department stores and others this fall. The majority of the group were home-lighting women who intend to take the supervisors' training course and who, in turn, will train home-lighting advisers and retail sales people in the new art of selling light for seeing.

General Electric and the utilities together have collected a vast fund of information and experience in home lighting. To pool and organize this experience for sales-training purposes demanded the work of specialists. So General Electric called on the leading specialists in the sales-training field—the LaSalle Corporation Training Service of LaSalle Extension University. Retail training, designed for utility, department store, furniture and electrical store salespeople will be covered by this six weeks' course.

•

Supercharged Diesel Installed in B.&M.

Rapid progress in the development of Diesel motive power for American railroad purposes is exemplified in the new Boston & Maine rail car which is equipped with the first supercharged 4-cycle Diesel engine to go in passenger service on the American continent. The car, equipped with a 12-cylinder Vee type Westinghouse Diesel engine, supercharged to deliver considerably greater horsepower than its normal 800-hp. rating, was delivered last week.

The power plant consists of a single Westinghouse 12-cylinder 9-in. bore by 12-in. stroke, 900 r.p.m. Diesel engine-generator set. The engine is supercharged to obtain an increased output over its unsupercharged rating of 800 hp. It is direct connected to a single-bearing direct-current generator which supplies power for the four traction motors, two on each truck.

•

Carrier Signs Contract to Finance Air Conditioning

Carrier Engineering Corporation, Newark, N. J., has announced the signing of a contract with Equipment Acceptance Corporation, subsidiary of Commercial Investment Trust, for the long-time financing of air-conditioning and commercial refrigeration installations under the F.H.A. National Housing Act.

The contract, which is in accordance with the standard plan of the new fed-

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eral act, involves contracts from $2,000 to $50,000 extending over a period of five years. Department stores, retail stores and shops, restaurants and industrial plants are expected to benefit chiefly from the operation of the new plan.

There are a number of large contracts for air conditioning which Carrier Engineering Corporation expects to close in the immediate future, as the result of credit extended under F.H.A. plan, M. S. Smith, treasurer of the corporation, said. The plan reduces financing charges and credit risks due to the government insurance feature of the plan.

•

Westinghouse Gets $2,000,000 Railway Order

Contracts for railway equipment in excess of $2,000,000 have been awarded to the Westinghouse Electric & Manufacturing Company by the Board of Transportation of New York City. The Westinghouse award is for motive power, control units and other accessories to be installed on new subway cars ordered for service on city-operated lines in New York. The equipment will be placed on cars built by the American Car & Foundry Company, the Pullman-Standard Car Manufacturing Company and the Pressed Steel Car Company. The contract for new cars exclusive of electrical equipment is the largest order placed for railway equipment since 1931.

Equipment to be supplied by Westinghouse will include 190-hp. traction motors, multiple-unit control for operation of eight- to ten-unit trains, battery-charging panels and car ventilating fans.

•

Electromaster Range Sales in 1935 Double 1934 Record

Interesting evidence of the ascending curve in the electric range business features a report recently made to the stockholders of Electromaster, Inc., Detroit, manufacturer of the Waldorf range and the Electromaster water heater. Richard B. Marshall, president of the company, states that the total sales for the first half of 1935 were nearly double the then new record by Electromaster during the first six months of 1934, and adds that the sales curve is still in the ascendency.

"July was the best month in the six years of Electromaster history," Mr. Marshall said. "The significance of this can be gained from the fact that ordinarily there is a seasonal lull in electric range sales during the summer months."

The Electromaster sales department, under the executive control of Gerald Hulett, vice-president, has just increased its sales staff to cover with resident representatives all territory east of the Rockies.

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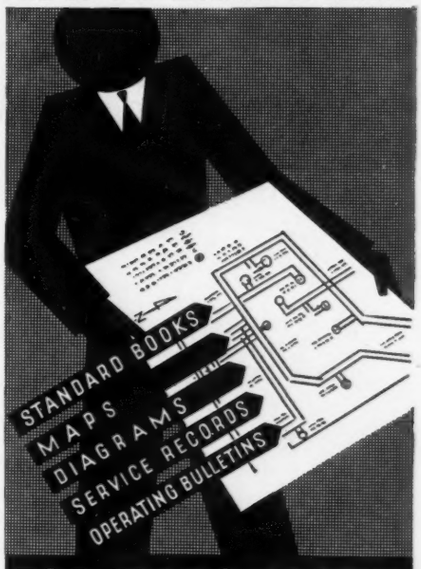

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